

Louisville & Nashville R. R. Co.

REGULATIONS GOVERNING USE OF
UNION CONTINUOUS AUTOMATIC
TRAIN STOP

M. & N. O. DIVISIONS

JANUARY 1, 1943

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**UNION CONTINUOUS, TWO INDICATION,
AUTOMATIC TRAIN STOP
MOBILE AND NEW ORLEANS DIVISIONS**

GENERAL DESCRIPTION

The Union Continuous Automatic Train Stop as installed on the N. O. & M. Division consists primarily of:

1. **Track or Wayside Equipment** which operates in connection with the Automatic Block D. C. track circuits, to establish communication to the locomotive electric equipment as to the condition of the track ahead. The Track or Wayside Equipment consists of a source of Alternating Electric Current connected, or supplied to the rails through transformers, relays, etc., and is connected to the rails or spaced off in sections braking distance, or maximum safe braking distance apart. As long as the track condition ahead will permit maximum allowable speed running, the current will flow down one rail, across the engine truck or pony truck wheels and back the other rail. If the track ahead is in such condition that the train should be at a speed under control preparatory to stopping at a stop signal, or obstruction, a relay will disconnect the current from the rails and no current will flow in the rails.
2. **Locomotive Electric Equipment** which operates in conjunction with the signaling current in the rails to establish a visual signal indication in the cab of the locomotive and operate an air valve.
3. **Locomotive Pneumatic Equipment** which controls the Automatic Train Stop Application of the brakes, whenever conditions may require.
4. **The Electric Equipment** consists of:

(a) The Receiver Coils mounted on the pilot of the locomotive about eight (8) inches above the rails. The purpose of the receiver coils is to pick up the signaling current in the rails by induction, and the circuit of the current so induced is completed through the amplifier set for the purpose of operating the train stop relay.

(b) The Electric Equipment Box located on top of the boiler which contains the amplifier, train stop relay, and other electrical apparatus. However, some locomotives have this equipment box located on the pilot beam. On Diesel Locomotives the equipment box is in the hood.

(c) The Two-Light Cab Signal Indicator located in the cab in the engineman's line of vision. The purpose of the cab signal indicator is to give the engineman a continuous visual signal indication of the condition of the track ahead. When the indicator is showing a GREEN light, maximum allowable speed is permitted. When the signal indicator is showing a RED light, the track ahead is occupied or obstructed and the speed of the train must be controlled in accordance with operating rules of the Transportation Department.

(d) The Electro-Pneumatic (Magnet) Valve located on the application control group. The purpose of the magnet valve is to actuate the valve which controls the Train Stop Application of the brakes whenever conditions may require.

(e) The Headlight Turbo-Generator on steam locomotives furnishes electric current to the electric equipment. On Diesel Locomotives, a motor-generator located in the hood is used in place of the headlight generator. Necessary conduit and wires making connections to the several parts.

(f) All Diesel Locomotives are equipped with Electric Speed Governor, which imposes maximum high speed in train stop and non-train stop territory.

(g) The Selector Switch on Diesel Locomotives, located in the hood. The purpose of the selector switch is to determine the operation of the device over train stop, train control, and in territory where there is neither train stop or train control.

5. **The Locomotive Pneumatic Equipment** consists of:

(a) The Application Control Group located on the side of boiler near steam dome, which under certain conditions controls the train stop application of the brakes.

(b) The Acknowledging Valve conveniently located in the cab for the engineman to operate. The purpose of the acknowledging valve is to permit the engineman to prevent the train stop application of the brakes by operating the valve on entering a danger zone.

(c) The Engineman's Brake Valve, the manual operation of which is the same as the Standard H-6 Brake Valve, and the MS-40 Brake Valve on Diesel Locomotives.

The brake pipe cut-off valve which prevents the engine-man interfering with the train stop application of the brakes by operating the brake valve, the emergency vent valve which makes possible an emergency application during a train stop application, and the train stop application valve, the movement of which under certain conditions gives the train stop application of the brakes, are contained in the pipe bracket portion of the engineman's brake valve. On Diesel Locomotives, the brake pipe cut-off valve and application valves are located in the application group in the engine room. The emergency vent valve will also permit the engineman on the second locomotive in double-heading service to make a manual emergency application of the brakes without operating the brake valve double-heading cut-out cock.

(d) Three reservoirs known as Stop, Reduction Limiting, and Acknowledging Reservoirs. The purpose of the reservoirs is to give air volume to the pipes to which they are connected.

(e) The Pneumatic Circuit Controller located on right side of the boiler just ahead of the cab. The purpose of the pneumatic circuit controller is to prevent the GREEN light of the cab signal indicator from showing during a train stop application. On Diesel Locomotives, the pneumatic circuit controller opens the magnet valve circuit during a train stop application.

OPERATING INSTRUCTIONS AND EXPLANATIONS FOR ENGINEMEN & HOSTLERS

6. Instructions contained herein do not conflict with special rules governing the use of Air Brake and Whistle Signal, nor the rules of the Transportation Department, except as stated in second paragraph of Rule No. 23, wherein Rule 292 and 509-A of Transportation Rules will govern when a train that is operating with the device cut out is stopped by a STOP and PROCEED signal, and as stated in Paragraph 19.

INSTRUCTIONS TO HOSTLERS

7. Special test circuits have been provided at Mobile, Gentilly, and New Orleans for the hostlers to test the train stop device.

8. It is the hostler's duty to see that the train stop is properly cut in for service and operative before the locomotive leaves the ready track.
9. Satisfactory performance of the device during the test is the hostler's assurance that the locomotive is in condition for service over equipped territory.
10. He should observe:
 - (a) That the air compressors are working.
 - (b) Brake valves in running position, and air gauges showing the proper pressure.
 - (c) That the train stop pneumatic cut-out lever is properly sealed in the cut-in position.
 - (d) Acknowledging valve is in the running (C) position.
 - (e) Steam Locomotives:
 - (1) Headlight generator running and electric equipment, main switch in (On) or horizontal position.Diesel Locomotives:
 - (2) The motor-generator running and selector switch in train stop position.
11. A test of the device must be made over the test circuits in the following manner: The locomotive should be stopped or run slowly over the first circuit. A GREEN cab signal light will indicate that the electric equipment is cut-in and operative. Run the locomotive off the first circuit. When the RED light appears stop the locomotive. The change in cab signal light from GREEN to RED must not be acknowledged. The train stop application of the brakes should follow within eight (8) seconds during which time the warning whistle should blow. This will indicate that the device is operative. The engineman's brake valve should be placed in lap position and brake pipe pressure should be reduced twenty-six (26) to thirty-two (32) pounds. With the brake valve in lap position operate the reset cock located under running board on right side of locomotive about three feet ahead of cab, to reset (Forward) position. Leave the reset cock in reset position until the application valve returns to normal position. The application valve should return to normal position within fifteen (15) seconds' time after the reset cock is placed in reset

position. Return the reset cock to running position and release the brakes. Diesel Locomotives, equipped with electric acknowledging, place the brake valve handle in lap position and when the application pressure charges to 80 pounds, operate acknowledging switch from (N) to (R) position and return to (N) position. The release time should be within seventy (70) seconds.

12. Run the locomotive over the second circuit. The cab signal light should change from RED to GREEN and back to RED. The change from GREEN to RED should be acknowledged by moving the acknowledging valve handle from running (C) position to acknowledging (A) position and returned to running (C) position after the warning whistle stops blowing. The train stop application should not follow.
13. If the above tests fail, notify roundhouse foreman; and if correct the locomotive is ready.

INSTRUCTIONS TO ENGINEMEN

14. It is the duty of the engineman to see that the train stop pneumatic cut-out lever is properly sealed in the cut-in position, the cab signal displaying RED light and the acknowledging valve handle in running (C) position.
15. **Doubleheading:** When two or more locomotives are coupled, or when there is a car, or cars between the locomotives, the engineman handling the head locomotive in the direction in which the locomotive may be moving, must have control of the brakes and all other engine brake valves must be cut out. The train stop on the head locomotive must be in service. On all other locomotives the train stop pneumatic cut-out lever must be sealed in the cut-in position and the electric equipment main switch located in conduit line near electric equipment box, in the (Off) position.
16. **Cab Signal Indications:**

GREEN: Proceed at speed governed by Transportation Operating Rules.

RED: Stop, or prepare to stop short of an obstruction or block signal at stop position. Train exceeding medium speed must at once reduce to that speed.

17. On approaching an automatic block signal at stop position the cab signal indication will change from GREEN to RED at breaking point (commonly known as "B" point), which is sufficient distance from stop signal to allow the train to be stopped by a service application of the brakes without over-running the signal. In most cases, this will be received on passing the automatic block signal at caution position. The change must be acknowledged or a train stop application will follow.
18. On passing an automatic block signal at stop position, the cab signal indication will change from RED to GREEN and back to RED. The change must be acknowledged or a train stop application will follow.
19. In case of conflict between automatic block signal and cab light indications, the more restrictive indication will govern.
20. Enginemen shall not forestall (acknowledge) an automatic brake application until a restrictive signal has been observed and is being obeyed.

To Prevent Train Stop Application: At the instant the cab signal indication changes from GREEN to RED a warning whistle will blow and will continue to blow for six (6) seconds. An automatic train stop application of the brakes will be received six (6) seconds after the cab signal changes from GREEN to RED. In order to prevent the train stop application, the acknowledging valve handle must be operated to the acknowledging (A) position within five (5) seconds after the cab signal changes from GREEN to RED, and left in acknowledging position until the warning whistle stops blowing, when the handle should be returned to running (C) position. Diesel Locomotives, the acknowledging switch must be operated from (N) to (R) position and held in this position for one (1) second and returned to (N) position.

21. **Release After Train Stop Application:** After a train stop application once starts, the brake valve handle must be placed in lap position and left in lap position. When the train comes to a stop, the engineman must operate the reset cock handle to reset (Forward) position. Allow the reset cock handle remain in the reset position for fifteen (15) seconds, then return the reset cock handle to running position, after which the brakes may be released in the customary manner. Diesel Locomotives, the brake valve handle must be placed in lap position and when applica-

tion pipe pressure charges to eighty (80) pounds, acknowledge, then the brakes may be released.

22. **Back-Up and Switch Movements:** In most cases the GREEN cab signal indication will be displayed when back-up and switching movements are made on main track. The RED cab signal indication will be displayed when engines are running against current of traffic on double track. Enginemen should be prepared to acknowledge a change in cab signal indication from GREEN to RED at any instant during such movements.

23. **Movements Operated Cut Out:** When automatic train stop equipment fails to operate as intended, enginemen must not cut it out of service, except in emergency (inability to release brakes), without first obtaining authority to do so from the train dispatcher. If, however, the failure occurs at a point where communication facilities are not available, the train dispatcher must be notified at the first point at which communication is available.

One-half the maximum speed must not be exceeded while the apparatus is cut out, unless the train is protected by absolute block. To obtain absolute block protection under this rule, a train operating with train stop cut out will not use block signal Rules 291 and 509-B, but will consider a STOP and PROCEED signal as a STOP signal coming under Rule 292 and 509-A of Operating Rules of the Transportation Department, and not pass it while indicating STOP and PROCEED, except under flag protection.

If telephone booth is available, advise the dispatcher before flagging.

When the train dispatcher authorizes the cut-out, or is advised of the failure of automatic train stop devices, he will be required to advise all opposing trains and closely preceding and following trains by "19" order that the train stop is cut out on any train that is being operated without the protection of these devices.

24. **Reporting Failures:** Failures and delays must be reported on Form 1802, revised July 1927. If necessary to cut out the device notify the chief dispatcher, who will notify signal supervisor, train control supervisor, master mechanic by wire message. Form 1802 blanks and message forms are provided in locomotive cabs. In addition to this, a full report should be made on work report, Form 1458, on arrival at terminal.

INSTRUCTIONS AND EXPLANATIONS AS TO METHOD OF TESTING, INSPECTING, AND MAINTAINING FOR MAINTENANCE MEN

25. The maintenance men will be responsible for any failure or irregularities of the equipment that may be found by the hostler on making the departure test.

26. Whenever practical, confer with the engineman on arrival of the locomotive, securing any information as to performance of the device and information that may assist in determining cause of a failure.

27. The after-trip test and inspection must be made as soon after the arrival of the locomotive as practical. The test may be made before or while the firebox is being cleaned.

28. The after-trip inspection report form must be filled out, on which should be recorded the condition of the equipment as found on arrival, and before any repairs or adjustments are made. Under REMARKS on the form must be shown all irregularities as found by the test and repairs and adjustments made to correct the irregularities.

29. A general inspection of the entire equipment must be made, noting the condition of the electric equipment and pneumatic equipment. Extreme care should be taken to note that all wiring, conduit, air pipes, castings, brackets, clamps, etc., are securely fastened to their supports, and that no excess vibration is possible in any portion.

30. Inspect the Pneumatic Cut-Out Lever. If the lever is found in the cut-out position, or the seal broken, the fact should be recorded on the inspection report form under REMARKS, giving reason for seal being broken, if ascertained.

31. The test should be made as follows:

(a) **Normal Pick-up.** With the test track circuit closed, determine the lowest current value at instant of train stop relay pick-up. Note and record the current value which should be between .20 and .30 ampere.

(b) **Generator Voltage.** Note and record the turbo-generator voltage with cab lights (only) on and with full load on. The voltage should be between 31 and 34 volts with 150 to 200 pounds steam pressure. On Diesel Locomotives the motor-generator should be between 31 and 34 volts.

(c) **Megohm Ground.** Test the insulation of the headlight and cab light wiring for grounds. Note and record the resistance of the ground which should not be less than one (1) megohm.

(d) **Pressures.** Note and record the steam pressure, main reservoir pressure, and train stop pressure. The train stop pressure should be adjusted to 60 pounds if necessary before making pneumatic equipment test. Diesel Locomotives, the pressure should be 50 pounds.

(e) **Acknowledging Time.** With GREEN cab signal light, operate the acknowledging valve to acknowledging position. Note and record the time that the GREEN light remains out, which should be between 16 and 25 seconds. Return the acknowledging valve to normal position and allow the acknowledging reservoir to charge. With GREEN cab signal light operate acknowledging valve to acknowledging position and ten seconds after, change cab signal light to RED. The train stop application should not follow. Diesel Locomotives equipped with electric acknowledging, change cab signal from GREEN to RED and operate the acknowledging switch from (N) to (R) position, holding the switch in (R) position not more than one (1) Second.

(f) **Delay Time.** Note and record the delay time which is taken from the instant the cab signal light changes from GREEN to RED to the starting of the train stop application. The delay time should be between five (5) and seven (7) seconds.

(g) **Brake Pipe Reduction.** Note and record the brake pipe reduction made by the train stop application. This should be between 26 and 30 pounds with 80 pounds brake pipe pressure and between 30 and 32 pounds with 100 pounds brake pipe pressure. Also note that a twenty (20) pound reduction is made at the normal rate of time.

(h) **Long Release Time.** Note and record the long release time which is taken with the engineman's brake valve in lap position from the instant the reset cock is placed in reset position to the instant the train stop application valve returns to normal position. The time should be between 7 and 10 seconds. Diesel Locomotives, the long release time should be between 58 and 70 seconds.

(i) **Short Release Time.** Note and record the short release time. This should be taken with a train stop application imposed. With the brake valve in running position, change the cab signal light from RED to GREEN. Place the brake valve in lap position and take the time from the instant the brake valve is placed in lap position to the instant the train stop application valve returns to normal position. The time should be less than 4 seconds.

(j) **Red to Green to Red Flash Time.** Note and record the RED to GREEN to RED flash time. This is taken with the pneumatic equipment in normal RED position. Change the cab signal from RED to GREEN and back to RED in not more than one (1) second time, the train stop application should be imposed. Diesel Locomotives, the time should not be more than one and three-tenths (1.3) seconds.

32. All repairs and adjustments should be made while the locomotive is in the roundhouse. The work report, Form 1458, must be signed by the maintainer before the locomotive is taken to the departure track.

33. No locomotive equipped with the train stop should be permitted to leave the roundhouse unless such apparatus is in operating condition and with the pneumatic cut-out lever properly sealed in the cut-in position.

34. The main reservoir and dirt collectors must be drained before the departure of the locomotive. If excess condensation is noted, the fact should be recorded on the inspection report under REMARKS.

35. A quarterly test and inspection of train stop equipment must be made and reported on the Monthly Test Report, Form 1750, and mailed to the superintendent of machinery, on the day the test is made. The test to be made in accordance with special instructions.

36. The entire pneumatic equipment must be thoroughly cleaned and tested every six months, or sixth monthly inspection. Necessary record of cleaning must be kept by the division train control supervisor.

The electric equipment relays, amplifiers, and receivers must be removed from service every two (2) years, thoroughly cleaned, repaired, tested, and adjusted to within limits of designed operating characteristics. Necessary record must be kept by the division train control supervisor.

The test loops must be properly maintained by the shop, or roundhouse force. Departure test loops must be inspected and tested monthly and record kept in transformer box.

37. Signal or track circuit maintainers report to and receive their instructions from the signal supervisor. They are also subject to the instructions of the signal engineer, or signal inspector, or signal supervisor of train control. They are responsible for the inspection, adjustment, and maintenance of the train stop track equipment.

FAILURES AND COMMON CAUSES FOR FAILURES

38. Train stop application with GREEN cab signal light:
- (a) Leaking or broken Pipe Nos. 1, 10, and 4.
 - (b) Train Stop Feed Valve sticking open and Safety Valve failing to relieve excess pressure.
 - (c) Excess vibration of Pipes Nos. 4 and 10 causing air leaks when pipes are vibrating.
39. Failure to carry GREEN cab signal light while block signals are clear:
- (a) Failure of wayside or track equipment.
 - (b) Open circuit in locomotive electric equipment.
 - (c) Cab signal GREEN light burned out.
 - (d) Turbo-Generator failure.
 - (e) Failure of locomotive electric equipment.

40. Cab signal lights flickering:
- (a) Low efficiency of Amplifier.
 - (b) Low current value of Track Circuits.
 - (c) Combination of (a) and (b).
 - (d) Receiver Coils loose on receiver core.
 - (e) Low turbo-generator voltage on low steam pressure.
 - (f) Loose connection in electric equipment wiring.
 - (g) Swinging ground in wiring of locomotive lighting and train stop wiring.
 - (h) Amplifier Pilotron Tubes loose in base or socket.
 - (i) Grid Leaks loose in receptacles or defective.
41. Failure to prevent train stop application by acknowledging:
- (a) Leaking Pipe Nos. 7, 14, 15, and 22.
 - (b) Acknowledging Pilot Valve sticking in normal position.
 - (c) Improper operation of Acknowledging Valve.
 - (d) Defective Acknowledging Valve.
42. Failure to obtain train stop relay pick-up:
- (a) Pilotron Tube or Ballast Lamp defective.
 - (b) Open in Receiver Coil Circuit.
 - (c) Open in Amplifier Circuit.
 - (d) Defective Grid Leak.
 - (e) Open circuit from Turbo-Generator.
43. Normal pick-up—track current value too high:
- (a) Low emission of Pilotron Tube.
 - (b) Defective Grid Leak.
 - (c) Loose connection at terminal.

- (d) Grounds in electric equipment wiring.
 - (e) Low voltage of Turbo-Generator.
 - (f) Poor commutation of Turbo-Generator, or Dynamo-motor.
44. Delay Time too short:
- (a) Timing reservoir Ball Check Gasket leaking or ball not seating.
 - (b) Timing Reservoir Exhaust Orifice becoming enlarged.
45. Delay Time too long:
- (a) Timing Reservoir Exhaust Orifice becoming obstructed or restricted.
 - (b) Timing Valve sticking or sluggish.
46. Long Release Time too long:
- (a) Pipe No. 4 supply choke restricted.
 - (b) Leaking Pipe Nos. 4, 5, 14, and 15.
 - (c) Sticking or sluggish Application Pilot Valve.
 - (d) On Diesel Locomotives leaking Pipes Nos. 4, 5, 10. Open contacts or opening wiring in magnet valve circuit.
47. Short Release Time too long:
- (a) Pipe No. 4 supply choke restricted.
 - (b) Leaking Pipe Nos. 4 and 5.
 - (c) Sticking or sluggish Application Pilot Valve.
48. RED to GREEN to RED Flash Time too long:
- (a) Timing Valve sticking or sluggish.

- (b) Stop Reservoir Exhaust Orifice restricted.
- (c) Acknowledging Pilot Valve not properly seating.

49. It is to be understood that the above are the most frequent failures and probable cause for same. Failures may be encountered and causes for failures may be found that are not given in the above.

C. J. BODEMER,
Superintendent of Machinery.

Approved:
W. E. SMITH,
Vice-President & General Manager.