U.S. Department
of Transportation

**Federal Railroad
Administration**

Memorandum

Date: June 15, 1998 Reply to Attn of: MP&E 98-63

Subject: Two-Way End-of-Train Device Questions and Answers

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To: Regional Administrators, Deputy Regional Administrators,
MP&E Specialists, MP&E Inspectors,
OP Specialists, OP Inspectors

On July 1, 1997, the *Two-Way End-of-Train Telemetry Devices,* Final Rule, 49 CFR 232.21 - 232.25 became effective. There has been several inquiries concerning the inspection and testing of the devices, as well as issues involving enroute failures. The purpose of this bulletin is to answer questions and provide guidance for uniform application and enforcement of this new rule.

Question: When does the device have to be armed?

The device has to armed and operable from the time the train departs the point of installation, until the train reaches destination. Anytime there is a message indicating the device is not armed, corrective action must be taken for an en route failure

Question: What tests have to be performed at the point of installation?

It must be understood that installation includes both the front and rear device. When either of these devices are installed and before the train departs, the following must be performed:

Î It must be determined that the identification code entered into the front unit is identical to the unique code of the rear unit.

Ï Determine that the quantitative value for brake pipe pressure displayed on the front unit is within three pounds per square inch of the reading displayed from either the rear EOT unit or a properly calibrated air gauge at the rear of the train. This reading must be compared after the train is charged.

Ð A test has to be made to ensure the device is capable of initiating an emergency power brake application from the rear of the train.

Question: What is the test procedure to ensure the device is capable of initiating an emergency power brake application from the rear of the train?

There are currently four acceptable methods of performing this test. The first three methods requires attaching the rear-of-train device to the last car of the train, establishing brake pipe pressure, and arming the device.

Î In the first method, the controlling locomotive would transmit an emergency brake application signal with the front unit manual switch causing an emergency application to be initiated from the rear of the train, thereby dumping the whole train into emergency.

Ï The second method requires closing the angle cock on the last or second-to-the-last car of the train, and then have the controlling locomotive transmit an emergency brake application signal with the front unit manual switch. Under this method only the last one or two cars of the train will effectuate an emergency brake application.

Ð Using the third method, an individual would close the angle cock between the rear-of-train device and the last car. Then have the controlling locomotive transmit an emergency brake application with the front unit manual switch, so that an individual at the rear of the train can determine whether the emergency valve functions properly by either observing the emergency indicator pop out, or observing brake pipe pressure at the rear device go to zero while hearing the exhaust of air from the device.

Ñ The final acceptable method of inspection is a bench test of the device (front and rear) which would be performed within a reasonable time period prior to the device being armed and placed on the train.

Question: Can anyone perform these tests?

If anyone other than a crew member performs these tests, the locomotive engineer has to be informed that the test (both front and rear device) was successfully performed. This can be either written or verbal. This could also be relayed by a third party who knows the test was successfully performed.

Question: Would these tests apply to a train using a distributive power unit (DPU) in the last third of the train?

No. This type of train is excepted from the two-way EOT requirements, provided the train has a locomotive located in the rear third of the train, capable of making an emergency brake application through a command effected by radio telemetry, or by a crew member in radio contact with the lead (controlling) locomotive.

Question: What is a bench test?

The purpose of this particular test is to ensure that the front unit will transmit an emergency brake application signal to the rear device and that the rear device is capable of initiating an emergency brake application from the rear of the train. The bench test has to consist of testing both the front and rear units (devices) that will be used on the train. They can be tested independent of each other, as long as the test is performed at the location where the device will be installed on the train. FRA will monitor this practice to ensure safety.

Testing the rear unit requires applying air pressure to the device and then transmitting an emergency brake application from a front unit using the front unit manual switch. The individual performing the test would determine the emergency valve functions properly by either observing the emergency indicator pop out or observing brake pipe pressure at the rear device go to zero while hearing the exhaust of air from the device.

The front unit that will be used on the controlling locomotive of a train would be tested by transmitting an emergency brake application from the device using the front unit manual switch, and a rear device would have to successfully receive the signal and activate the emergency air valve.

Both tests must be performed within a reasonable time period prior to the device being armed and placed on the train.

Question: What is a reasonable time period?

A reasonable time period must be determined on a case by case basis, based on the factual situation at a specific location, as there are numerous factors that impact the notion of 'reasonable'. The following discussion is intended as general guidance for inspectors to consider in determining whether a bench test at a particular location was conducted within a reasonable time of its installation on a train. This discussion is not intended to create or establish any strict time requirements. The following factors should be considered:

- The environment where the device is tested and stored:
  - Free from weather elements?
  - Free from excessive dust?
  - Free from dirt and grease?
  - Accessible to possible tampering?

- Physical treatment of the device after a successful bench test.

- Railroad's tracking and monitoring of devices after testing.

- Use of the locomotive after the testing of the front unit.

- Past effectiveness of bench testing procedures at the particular location.

For example, if the devices are tested and stored in a controlled environment, that is free from weather elements, excessive dust, grease, and dirt, then a reasonable amount of time between the testing and installation of the device might be 8 hours or more. Whereas, in circumstances where the devices are haphazardly thrown into a corner of a shop or are placed in the rear of a truck to be bounced around a yard after being tested, then a reasonable amount of time may be one hour or less. Furthermore, the effectiveness of a railroad's bench testing procedures should always be considered in determining what constitutes a reasonable time period. Consequently, FRA inspectors should provide detailed evidence and fully describe a railroad's bench testing procedures in order to support any determination that the time period between the bench test and installation of a device on a train was not reasonable.

Question: Can devices be bench tested and taken to other locations for application?

No, because 232.25(c) requires the device shall be tested at the initial terminal or other point of installation. This implies that the device must receive the bench test at the location or yard where it will be installed on the train.

Question: What are the testing requirements if locomotive power is changed and a different front unit is used?

At the point of installation, whether it is the front or rear device, all testing requirements apply. If the locomotive power is changed and a new front device is installed on the train, all testing requirements apply.

Question: What about the calibration requirements?

Both the front and rear units have to be calibrated for accuracy according to the manufacturers specifications and procedures at least once every 365 days. The date of the calibration, the location where the calibration is made, and the name of the person performing the calibration has to be legibly displayed on a weather-resistant sticker or other marking device affixed to the outside of the device (both the front unit and rear unit.) If the device is integrated into the computer of the locomotive, the sticker information should be entered on Form FRA F6180-49A, the locomotive Blue Form.

Question: Is there any grace period for applying the stickers?

All rear devices will have the sticker applied by July 1, 1997. FRA will expect the sticker to be applied on all front units by September 1, 1997.

Question: Are railroads required to keep spare batteries at specific locations?

No, it is within the railroad's discretion to determine when and where batteries will be kept and charged. There are sufficient incentives for railroads to ensure that the batteries are sufficiently charged at all times: because of the speed restrictions imposed on trains that develop failures en route; and strict liability for failure of the batteries en route.

Question: What actions have to be taken when the device develops a failure en route?

If the device develops a failure en route, the speed of the train is restricted to 30 mph. In addition to observing the 30 mph speed restriction, the train is not be permitted to operate over a section of track with an average grade of two percent or greater over a distance of two continuous miles, unless the conditions contained at 232.23(g) are met.

Question: On some units, front-to-rear failures and rear-to-front failures are displayed. Are both of these failures considered an en route failure?

Since the intent of the rule is to have the capability of initiating an emergency brake application at the rear of the train, only the front to rear failure is considered an enroute failure. The rear to front failure does not affect the ability of the device to initiate the emergency from the rear of the train. If the engineer is unable to determine if the communications failure is front-rear or rear-front, then any communications failure must be considered an enroute failure and corrective action must be taken.

Question: Is an intermittent communication failure considered an en route failure?

No, there has to be a continuous loss of communication between the front and rear unit of at least 16 minutes and 30 seconds.

Question: Can a train proceed over a heavy grade with a defective device?

A train can not proceed over a heavy grade unless the defective device is replaced with a fully operational device, or one of the following alternative methods is used:

- An occupied locomotive helper is attached to the rear of the train with the brake pipe connected and tested to ensure brake operation. The helper engineer will initiate and maintain two-way voice radio communication with the engineer on the head end of the train. If communication is lost prior to passing the crest of the grade, the train should be stopped until communication has been restored, if this can be done safely. If communication is lost once the descent has begun, the helper locomotive engineer and the head end engineer will act to stop the train if the train reaches a predetermined rate of speed that indicates a need for emergency braking. The predetermined rate of speed is established by the railroad and should be indicated in the railroad's timetable;

Ï An occupied caboose is attached to the end of the train with a tested, functional brake valve capable of initiating an emergency brake application from the caboose. The occupant of the caboose must establish and maintain radio voice communication with the head end engineer in the same manner as prescribed for the occupied locomotive helper;

Ð A radio-controlled locomotive is located in the rear third of the train, and is under continuous control of the head end engineer by means of telemetry, and if the radio-controlled locomotive is capable of initiating an emergency brake application from the lead (controlling) locomotive.

Question: Does this mean the train would have to stop on a grade if a failure occurs?

Whenever a failure occurs enroute, the train is prohibited from operating over a section of track with an average grade of two percent or greater over a distance of two continuous miles. If the train develops the failure while on this grade, the engineer should take immediate action to safely bring the train to a stop, using the railroad's operating procedures for stopping trains on a grade.

Question: If a helper locomotive is used on the head end of a train, does it have to be linked to the two-way EOT?

If a locomotive helper is attached to the front of the train to help the train over a grade, it would not have to be linked to the two-way EOT *provided* that the locomotive that was originally controlling the train is still armed and capable of initiating an emergency brake command to the rear device and two-way voice radio is initiated and maintained by the helper locomotive engineer with the engineer of the original lead locomotive until the move is completed. If communication is lost, each engineer will immediately act to stop the train if the train reaches a predetermined rate of speed that indicates a need for emergency braking. The predetermined rate of speed is established by the railroad and should be indicated in the railroad's timetable.

Question: If a train were to have problems and stalled in a tunnel where communications is lost, and it took longer than 16 minutes and 30 seconds to correct, could the train move out of the tunnel so that communications could be re-established or is this a communications failure requiring other corrective measures?

If this incident occurred, the train would be allowed to move out of the tunnel. Once out of the tunnel, if communications is not re-established, the train would have to be brought to an immediate stop. Corrective action for a communication failure would have to be taken.

Question: If a train has to be cut because it has insufficient power to get over a hill, what has to be done with regards to the two-way EOT?

If a train has to be cut because there is insufficient power to pull it over a hill or grade, then the moving section of the train must be equipped with a two-way EOT.

Question: Can a "Local Train" that is not equipped with a two-way EOT operate above 30 mph?

A local train as defined in 232.23(a)(3), that does not operate over a section of track with an average grade of 2% for two continuous miles, can run at authorized track speed without a two-way EOT. In many cases, this could be above 30 mph.

Question: Can a "work train" run above 30 mph if it is not equipped with a two-way EOT?

A work train as defined in 232.23(a)(4), that does not operate over a section of track with an average grade of 2% for two continuous miles, can run at authorized track speed without a two-way EOT. This could be above 30 mph.

Question: Can any train be dispatched without a two-way EOT if it does <u>not</u> exceed 30 mph?

Only if the train will not travel over a heavy grade as defined in Part 232.23(a)(1), or is specifically excepted from the requirements at 232.23(e).

Question: If a train is equipped with an electronically controlled brake system (ECP), would an EOT be required?

Yes, because the ECP train sets that are currently operating are an overlay system of regular pneumatic brakes. Since these trains can be run in either electronic or regular pneumatic mode, a two-way EOT device would have to be on the rear of the train. If the train is all electronic, the two-way EOT requirements will be covered by the waiver permitting this type of operation.