

**Recommended Instructions for End-to-End Test of Positive Train Control  
Wayside Interface Units (WIU)**

Revised 2025 (4 pages)

**A. Purpose**

This Manual Part makes recommendations for the End-to-End testing of Positive Train Control (PTC) Wayside Interface Unit (WIU) initial provisioning of installations (signals, switches, grade crossings, and/or hazard detectors) with an equipped train and any required Office Segment components (e.g., WSRS, Safety or TSR Server). For the purpose of this test, a PTC-equipped train can be a locomotive or unit equipped with PTC devices that possess the same onboard functionality as a train.

For the purposes of this Manual Part, the WIU functionality encompasses only the conversion of wayside device status into data messages and responses to incoming messages. This Manual Part addresses the additional testing required for Office Segment and train connectivity.

This End-to-End test encompasses all the components of the PTC system including the Office Segment, WIU installations, and an equipped train. The PTC system must be functional in order for this test to successfully determine that the field conditions are reflected in the PTC-equipped train.

**B. General**

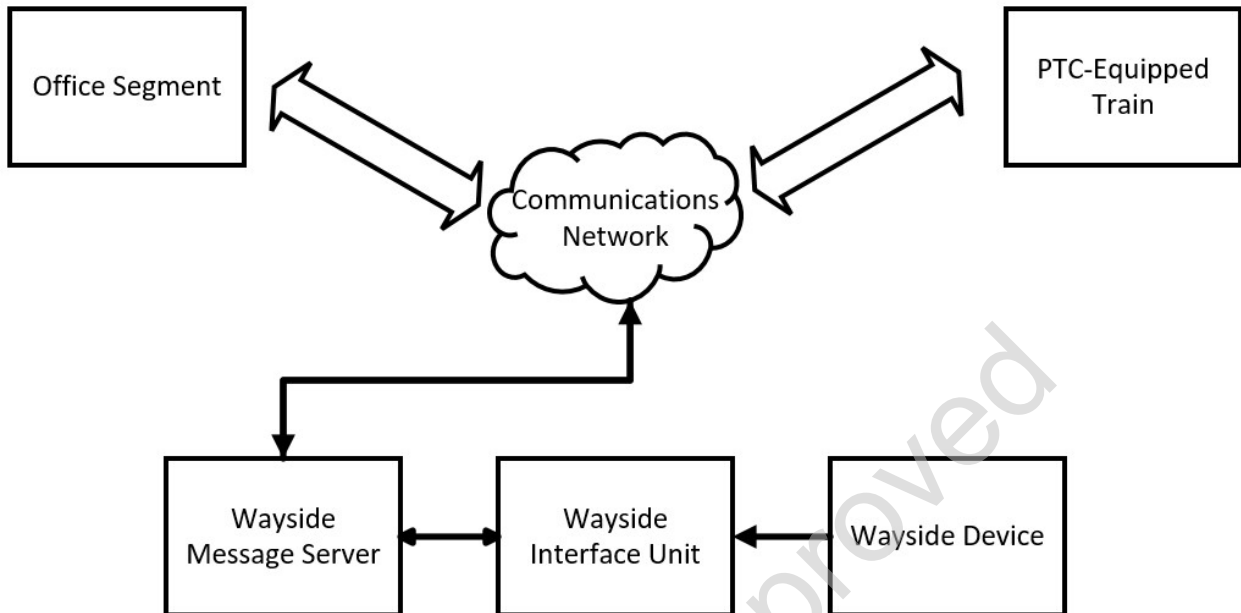
1. The WIU generally performs the tasks of:
  - a. Converting wayside device status information into messages that are transmitted to the communications network.
  - b. Receiving and responding to (if appropriate) messages from the communications network.
2. As applicable, the location, WIU address, and other characteristics of the WIU and associated wayside devices are identified in a track database maintained by the host railroad (or others). The validation of this information shall be verified prior to placing in service in accordance with railroad procedures.
3. This Manual Part generally applies to non-vital overlay, vital overlay, vital stand-alone, and mixed PTC systems.

**C. Installation**

WIUs shall be installed per Manual Part 1.5.1. Recommended Instructions for the Installation and Maintenance of Solid-State Equipment.

**D. Tests**

1. At the location or locations monitored by the WIU, all appropriate tests should either be conducted in conjunction with WIU tests or have been conducted before WIU tests are performed.
2. Tests which may interfere with safe operation of trains shall not be started until train movements have been fully protected as instructed per railroad procedures. Temporary repairs or adjustments, when required, shall be made in such a manner that safety of train operation shall not be impaired. When repair, adjustment, change, or replacement is made, tests shall be made immediately to determine the WIU functions as intended. When testing, proper instruments shall be used, and it shall be known that no unsafe conditions are created by the application of testing equipment. Protection for train movements shall be provided per railroad instructions. Consideration shall be given to data that may be transmitted over the communications network from the unit under test to prevent any unsafe condition.
3. All testing requires verification that actual data values sent or received by the Office Segment or PTC-equipped train corresponds to the proper wayside device and device status. Additional system level tests may be required as defined in the PTC Safety Plan or as per railroad instructions. A final PTC test should be performed with the actual verified (vital) data used by the Onboard Computer.
4. End-to-End WIU tests involve all of the communication links that the WIU can use. The Office Segment and/or train communications interface must be functioning as intended. Figure 2432-1 shows a typical arrangement for End-to-End WIU test.



**Figure 2432-1 Typical Arrangement for WIU End-to-End Test**

5. WIU tests shall verify all relevant WIU status information. As an example, the following types of information should be verified for WIUs developed in compliance with AAR Manual of Standards and Recommended Practices, Standard S-9202 Interoperable Train Control Wayside Interface Unit Requirements:
  - a. WIU address and other header information is correct and properly decoded by the PTC-equipped train and, if applicable, the Office Segment.
  - b. All monitored device status changes are reflected in the PTC-equipped train and, if applicable, the Office Segment. Appropriate actions shall be taken to protect train movements against simulated conditions in the field created during testing. All valid switch, signal, and hazard detector states shall be tested in the field and verified to be received correctly by the PTC-equipped train and if applicable the Office Segment.
  - c. Testing of many, if not all, of the states (e.g., G/R, G/D, 1 Normal, 1 Reverse, or 1 not indicating,) may be performed in a lab environment for microprocessor-based systems that control signals and switches, etc. This requires testing against a known logic controller application program and set of vital configuration settings. Field testing in this case requires validation that the application

program and all vital configuration settings used in lab testing are the same that exists in the field.

- d. Additional testing requirements may be specified by manufacturers or individual railroads such as testing of invalid signal states. These tests may not be required to be done in the field.
6. Upon completion of testing, all conditions in the field, Office Segment, and PTC-equipped train shall be restored to their proper operational state before placing in service.
7. Results of tests required herein and all other tests that may be required shall be recorded, as instructed per railroad procedures, on the prescribed forms.

Draft Not Yet Approved