

**Recommended Instructions for End-to-End Test of Positive Train Control
Wayside Interface Units (WIU)**
Revised 2023 (4 pages)

A. Purpose

1. 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, highway crossings and/or defect detectors) with an equipped train and any required Office Segment components (e.g., WSRS, Safety or TSR Server). For the purpose of this test, an equipped train can be a locomotive or unit equipped with PTC devices that possess the same functionality as a train.
2. 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.
3. 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 equipped train.

B. General

1. The WIU generally performs the tasks of:
 - a. Converting wayside device status information into serial messages in the form of datagrams 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 is not covered in this Manual Part but is 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 on the wayside signal equipment 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 replacements are made, tests shall be made immediately to determine the device 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. Proper protection for train movements shall be provided as instructed¹. 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 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 instructed¹. A final PTC test should be performed with the actual verified (vital) data used by the On-Board 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.

¹ The term "as instructed" as used herein refers to individual railroad or purchaser instructions.

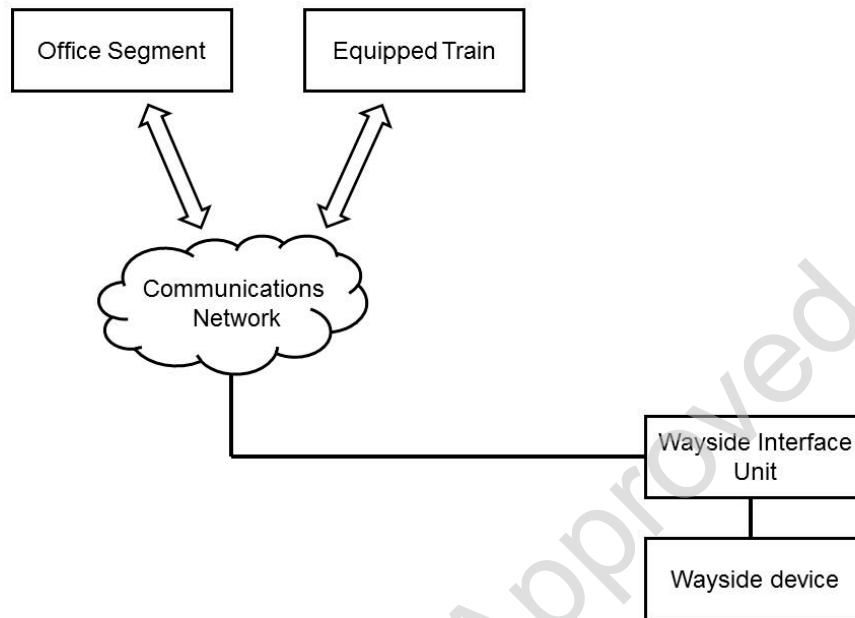


Figure 2432-1 WUI Test Typical Arrangement

5. WUI tests shall verify all relevant WUI status information. As an example, the following types of information should be verified for WUIs developed in compliance with AAR Standard S-9202 Interoperable Train Control Wayside Interface Unit Requirements:
 - a. WUI address and other header information is correct and properly decoded by the equipped train and if applicable the Office Segment.
 - b. All monitored device status changes are reflected in the equipped train and if applicable the Office Segment, and appropriate action is taken to protect against simulated conditions in the field created during tests (switch position, signal aspect, hazard detector, crossing activation, track occupancy, approach lighting, etc.). All valid switch, signal, and hazard detector states shall be tested in the field and verified to be received correctly by the 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 Nor, 1 Rev, 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. Field testing in this case requires validation that the application program used in lab testing is 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 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 on the prescribed forms.

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