



## WSDOT Test Method T 427

### ***Test Method for NEMA Type Traffic Controller Cabinet, 300 Series (Type 170/2070) Traffic Controller Cabinet, and Advanced Transportation Controller (ATC) Cabinet Loop Amplifier Testing***

#### 1. Scope

The purpose of this test method is to evaluate the operation of individual Loop Amplifiers which are supplied with each Traffic Controller Cabinet. This test method may also be used to test Loop Amplifiers submitted for testing as piece parts upon request.

#### 2. Reference Documents

- AASHTO/ITE/NEMA Publication ATC 5301, Advanced Transportation Controller (ATC) Cabinet Standard
- Caltrans Transportation Electrical Equipment Specifications
- FHWA-IP-78-16, Type 170 Traffic Signal Controller System Hardware Specification
- NEMA Standards Publication TS-1, Traffic Control Systems
- NEMA Standards Publication TS-2, Traffic Controller Assemblies with NTCIP Requirements

#### 3. Safety

Voltages up to  $135 V_{ac}$  may be present on the test apparatus when energized. Caution should be exercised when operating the test apparatus. Only the interface of a Loop Amplifier (buttons and switches) and the interface of the test apparatus (buttons and switches) shall be touched while energized. Electro-Static Discharge (ESD) Wrist Straps shall be removed prior to energizing circuits.

#### 4. Apparatus

An Electro-Static Discharge (ESD) Wrist Strap with cord and alligator clip shall be worn when handling Circuit Card Assemblies (CCA's) to prevent ESD damage. The Wrist Strap shall be connected via the cord to the Traffic Controller Cabinet chassis ground or the ESD mat in the testing area in order to maintain the card handler at the same electrical potential as chassis ground. The Wrist Strap shall be removed prior to energizing circuits.

Metalized, static-shielding bag to protect each Loop Amplifier from Electro-Static Discharge (ESD) while transporting between the Traffic Controller Cabinet and the testing area.

Electro-Static Discharge (ESD) mat connected to earth ground for queueing of Loop Amplifiers to test.

ATSI Loop Amplifier Tester model QC-330, or device capable of supplying operating power to the Loop Amplifier Unit-Under-Test (UUT) and capable of simulating Class 1, Class 2, and Class 3 vehicle calls (0.12 $\mu$ H, 0.3 $\mu$ H, and 3.0 $\mu$ H inductance signals, respectively, supplied to the UUT).

## 5. Procedure

### 5.1 Removal and Setup

**For Loop Amplifiers supplied with a Traffic Controller Cabinet:** Ensure that the Traffic Controller Cabinet is off prior to removing Loop Amplifiers. Attach one end of the ESD Wrist Strap to a convenient wrist, and the other end to a convenient chassis ground point of the Traffic Controller Cabinet. Remove each Loop Amplifier and place each in a separate static-shielding bag for transport to the testing area. Once all Loop Amplifiers have been removed, disconnect the ESD Wrist Strap from the chassis ground point of the Traffic Controller Cabinet.

**For Loop Amplifiers submitted for testing as piece parts:** Open packaging at the testing area. If any Loop Amplifiers are not in a static-shielding bag, place them in one at this time.

**For all Loop Amplifiers:** Proceed to move all Loop Amplifiers to the testing area if not already done. Connect one end of the ESD Wrist Strap to the ESD mat of the testing area. Remove each Loop Amplifier from its static-shielding bag and place on the ESD mat to prevent ESD damage while in queue for test.

Ensure the Loop Amplifier Tester is off. Connect a Loop Amplifier to the Tester. Remove the ESD Wrist Strap and leave the other end connected to the ESD mat. Power up the Loop Amplifier Tester.

### 5.2 Initial Condition

If the UUT is so-equipped, ensure that Delay timing, Extension timing, and all other options are off. Ensure that the Loop Amplifier is set to Presence mode, not Pulse mode. Repeat this process for each channel with which the UUT is equipped.

### 5.3 Sensitivity Adjustment

Set the sensitivity of each channel to minimum. Press the "Class 1" button for Channel 1 and note the duration of the "Call" indication. Increment the sensitivity for Channel 1 until the "Call" indication lasts more than two seconds. Repeat this process for each channel with which the UUT is equipped.

### 5.4 Pulse Mode Test

Set Channel 1 to Pulse mode. Press and hold the "Class 1" button for Channel 1. The "Call" indication should come on briefly to verify a Pulse condition. Wait three seconds. While still holding the "Class 1" button, press the "Class 2" button. A second "Call" indication should come on briefly to verify a second vehicle Pulse condition. If not, this test fails. Release the buttons and set Channel 1 back to Presence mode. Repeat this process for each channel with which the UUT is equipped.

## 5.5 Delay Timing Test

Set Channel 1 Delay timing to three seconds. Press and hold the “Class 1” button for Channel 1. The “Call” indication should blink for three seconds, then become steady on. If not, this test fails. Release the button and set Channel 1 Delay timing back to zero. Repeat this process for each channel with which the UUT is equipped.

## 5.6 Extension Timing Test

Set Channel 1 Extension timing to three seconds. Press and release the “Class 1” button for Channel 1. The “Call” indication should be steady on for three seconds, then off. Press and release the button again, wait two seconds, then press and release again. The “Call” indication should be steady on for a total of five seconds, then off. If not, this test fails. Set the Channel 1 Extension timing back to zero. Repeat this process for each channel with which the UUT is equipped.

## 5.7 Sustained Presence and Sustained Presence Recovery Test

Press and hold the “Class 3” button for Channel 1. Hold the button for at least ten seconds. The “Call” indication should be steady on for the duration of this action. Release the button for one second, then press it again. The “Call” indication should turn off for a moment, then turn back on indicating a new “Call”. Release the button and the “Call” indication should turn off. If not, this test fails. If this test fails, return to section 5.3 to readjust the sensitivity and retry this test. If this test fails after three sensitivity adjustments, the UUT is considered faulty. Repeat this process for each channel with which the UUT is equipped.

## 5.8 Test Completion

Upon successful completion of all tests on all channels, power down the Loop Amplifier Tester. Attach the ESD Wrist Strap to one wrist, remove the Loop Amplifier from the tester, and place it in a static-shielding bag. Repeat this process for each Loop Amplifier submitted for testing. Return all test equipment to their proper storage location.

## 5.9 Re-Installation and Power-Up

**For Loop Amplifiers supplied with a Traffic Controller Cabinet:** Transport all Loop Amplifiers from the testing area to the Traffic Controller Cabinet under test. Ensure the Traffic Controller Cabinet is off. Attach one end of the ESD Wrist Strap to a convenient wrist, and the other end to a convenient chassis ground point of the Traffic Controller Cabinet. Remove each Loop Amplifier from its separate static shielding bag and re-install into the Traffic Controller Cabinet. Once all Loop Amplifiers are re-installed, remove the ESD Wrist Strap from chassis ground and the wrist. Power up the Traffic Controller Cabinet and ensure that all Loop Amplifiers are functioning.

**For Loop Amplifiers submitted for testing as piece parts:** Properly package the Loop Amplifiers for shipment to their final destination.

## 6. Report

Record any deficiency that does not meet the above minimum requirements. Verification tests shall be recorded in MATS as “As Received” if sufficient, and “As Shipped” if deficient but corrected. Verification tests that do not apply shall have neither option checked. The overall test result shall be recorded as a “Pass” or “Fail” for test T427 in MATS.

## Performance Exam Checklist

**Test Method for NEMA Type Traffic Controller Cabinet, 300 Series (Type 170/2070) Traffic Controller Cabinet, and Advanced Transportation Controller (ATC) Cabinet Loop Amplifier Testing**

### WSDOT Test Method T 427

Participant Name \_\_\_\_\_ Exam Date \_\_\_\_\_

Procedure Element	Yes	No
1. Removal and Setup		
2. Initial Condition		
3. Sensitivity Adjustment		
4. Pulse Mode Test		
5. Delay Timing Test		
6. Extension Timing Test		
7. Sustained Presence and Sustained Presence Recovery Test		
8. Test Completion		
9. Re-Installation and Power-Up		
10. Report		

First Attempt: Pass      Fail                      Second Attempt: Pass      Fail

Signature of Examiner \_\_\_\_\_

Comments:

