Automatic Vehicle Classification (AVC)– Site Test

This test will confirm that the AVC equipment at the site is fully operational, per manufacturer's specifications, prior to network connectivity.

AVC: General Information

Project Number: _____ Project Name: _____

Project Stationing: _____ Date of Test: _____

Device Name: _____ Manufacturer: _____

Serial #: _____ Model #: _____

Username (If Required): _____ Password (If Required): _____

Communication Method: _____ IP Address: _____

Subnet Mask: _____ Inspector: _____

AVC: General Requirements

Requirement	Pass	Fail	Notes
Verify location of AVC installation is as per the plans. Latitude: _____ Longitude:_____	☐	☐	
Verify height of pole and mounting height of AVC	☐	☐	
Verify that NHDOT-approved AVC hardware is installed.	☐	☐	
Verify the right type of loop wire and lead-in cable able is being used.	☐	☐	
Verify loop-lane association	☐	☐	
Label loops according to loop-lane association using permanent marker	☐	☐	

AVC: AC Power – Device Specific

Requirement	Pass	Fail	Notes
Verify voltage in AVC load center is within +/- 5% of 120 VAC.	☐	☐	

AVC: AC Power – Device Specific			
Requirement	**Pass**	**Fail**	**Notes**
Verify that the manufacturer's recommended power/communication cable is being used and is of adequate length.	☐	☐	

AVC: Calibration			
Requirement	**Pass**	**Fail**	**Notes**
Follow the directions on the accompanying Test sheets			
Complete AVC Operations Test for Volume.	☐	☐	
Complete AVC Operations Test for Classification.	☐	☐	

Overall AVC Site Test: ☐ Pass ☐ Fail

Inspector Name: _____ Organization: _____ Signature: _____

Witness Name: _____ Organization: _____ Signature: _____

Date: _____

Automatic Vehicle Classification (AVC)– Communications & Systems Test

This test will confirm that the installed equipment is fully operational utilizing New Hampshire's Traffic Data Management System (TDMS) at the NHDOT BOT.

AVC: General Information

Project Number:		Project Name:	
Project Stationing:		Date of Test:	
Device Name:		Manufacturer:	
Serial #:		Model #:	
Username (If Required):		Password (If Required):	
Communication Method:		IP Address:	
Subnet Mask:		Inspector:	

AVC: Prerequisites*

Requirement	Pass	Fail	Notes
Contractor has coordinated with the CLR Analytics Inc and has established connectivity to the AVC unit from the CLR office.	☐	☐	
Contractor has verified all device components are configured with supplied IP's, configurations, and interface login credentials, and all devices are remotely accessible.	☐	☐	
Contractor must be ready, with all necessary parties and preparation, to start the testing at the designated start time.	☐	☐	

*-Failure to meet any of the prerequisite requirements shall be grounds for immediate testing termination

AVC: Communications			
Requirement	**Pass**	**Fail**	**Notes**
If wireless communications are utilized, document the signal strength when cabinet door is closed. _____dB	☐	☐	
Verify communications to the AVC (via SSH).	☐	☐	
Verify device status appears on VSign web portal.	☐	☐	
Generate a manual communications failure at the AVC cabinet and verify VSign Web Portal displays the error. Verify the AVC responds after communications have been restored.	☐	☐	
Verify VSign web portal regains communication to the AVC after power has been disconnected in the field for 2 minutes then restored.	☐	☐	

AVC: Central Control			
Requirement	**Pass**	**Fail**	**Notes**
Perform a full diagnostic scan VSign web portal and confirm no errors shown.	☐	☐	
Disconnect power to the device and verify a power supply error is displayed in VSign Web Portal. Verify the error no longer exists after power is restored.	☐	☐	
Verify that correct volume data is being communicated to the VSign Web portal.	☐	☐	
Verify that correct speeds are being communicated to the VSign Web Portal from the AVC.	☐	☐	
Verify that correct vehicle class are being communicated to the VSign Web Portal from the AVC.	☐	☐	
Log into VSign Web Portal and verify no errors reported. Verify web interfaces display all information needed for remote monitoring of device status. Verify all loops are properly configured in the VSign Web portal.	☐	☐	

Overall AVC Systems Test: ☐ Pass ☐ Fail

Inspector Name: _____ Organization: _____ Signature: _____

Witness Name: _____ Organization: _____ Signature: _____

Date: _____

AVC Operations Test – Volume

Site: _____

Date: _____ Time: _____

Objective

To verify and demonstrate the functionality and accuracy of volume for the detector locations.

Prerequisites

Detector and cabinet installation must be complete. Lane must be open to traffic. NHDOT inspector must be present during testing.

Access the Internet time (https://time.is/), which will be used as a reference of volume test.

Verify VSign Hub's time is the same as Internet time.

Test Equipment

A stopwatch and traffic count board. An option is to use video camera to record videos. Under this case, there is a need to ensure the camera's clock is accurate enough (or write down the offset) compared to Internet time.

Success Criteria

Volume obtained from each detector for each lane of traffic will be within +/- 10 percent of each sample size. Sample size will be ten minutes, or 50 vehicles, whichever comes first. Traffic will be running at typical free-flowing speed and condition.

Test Instructions

1. Record the observed actual hand count volume from field/video and detector counts for ten minutes, or 50 vehicles, whichever comes first.
2. Record the lane number according to the proximity of the device. Closest lane to the device is lane #1.
3. Record the volume of vehicles detected by the sensor over the test period.
4. Subtract hand count volume from detector count volume and then divide by the hand count volume. Multiply by 100 to get the percent accuracy.
5. Indicate pass if result is +/- 10 percent.
6. Adjust the detection settings and repeat if percent accuracy is out of range.

AVC: Volume Test Results								
Lane #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Test Duration (min:sec)								
Start Time (hh:mm:ss)								
End Time (hh:mm:ss)								
Observed Hand Count Volume								
Detector Count Volume (from VSign)								
% Accuracy = (100 x (detector count – hand count)/(hand count))								
Pass or Fail (Pass if accuracy is < +/- 10%*								
Detection Setting								

*-Or per the manufacturers specifications.

Overall AVC Volume Test: ☐ Pass ☐ Fail

Inspector Name: _____ Organization: _____ Signature: _____ Date: _____

Witness Name: _____ Organization: _____ Signature: _____

AVC Operations Test – Speed

Site: _____

Date: _____ Time: _____

Objective
To verify and demonstrate the functionality and accuracy of speed for detector locations.

Prerequisites
Detector and cabinet installation must be complete. Lane must be open to traffic. NHDOT Inspector must be present during testing.

Access the Internet time (https://time.is/), which will be used as a reference of volume test.

Verify VSign Hub's time is the same as Internet time.

Test Equipment
A calibrated radar gun, a stopwatch, 2-way radios, and a laptop.

Procedure
1. Ensure that Detector unit is functioning
2. Set the start time and duration of individual vehicle record display on the VSign Web Portal to 3 minutes.
3. Record the individual speeds of 16 consecutive vehicles using radar gun. If measuring consecutive vehicles is not possible, measure speeds for as many vehicles in the lane as possible, for 16 vehicles or 3-minute time period, whichever comes first.
4. Simultaneously to recording the 16th vehicle, or completing the 3-minute time period, immediately record the current Detector Mean Speed as indicated at that moment by the Detector unit.
5. Compute the mean (Average) speed of the 16 vehicles, based on radar gun readings.
6. Compute the Modified Radar Gun Mean Speed (= radar gun mean speed / cosine theta), if needed, if radar gun is not shooting head-on at vehicles.
7. Compare the Modified Radar Gun Mean Speed to the Detector Mean Speed. Pass if difference < 5 mph. If test does not pass, adjust the sensitivity of the sensor and retest.
8. Repeat for each lane.

Overall AVC Speed Test: ☐ Pass ☐ Fail

Inspector Name: _____ Organization: _____ Signature: _____

Witness Name: _____ Organization: _____ Signature: _____ Date: ____

AVC: Speed Test Results								
Lane #	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Vehicle 1 Radar Speed (mph)								
Vehicle 2 Radar Speed (mph)								
Vehicle 3 Radar Speed (mph)								
Vehicle 4 Radar Speed (mph)								
Vehicle 5 Radar Speed (mph)								
Vehicle 6 Radar Speed (mph)								
Vehicle 7 Radar Speed (mph)								
Vehicle 8 Radar Speed (mph)								
Vehicle 9 Radar Speed (mph)								
Vehicle 10 Radar Speed (mph)								
Vehicle 11 Radar Speed (mph)								
Vehicle 12 Radar Speed (mph)								
Vehicle 13 Radar Speed (mph)								
Vehicle 14 Radar Speed (mph)								
Vehicle 15 Radar Speed (mph)								
Vehicle 16 Radar Speed (mph)								
Radar Gun Mean Speed (mph)								
Cosine Theta								
Modified Radar Gun Mean Speed (mph)								
Detector Mean Speed (mph)								
% Accuracy = (100 * Radar Mean Speed – Detector Mean Speed) / Radar Mean Speed								
Pass or Fail (Pass if % Accuracy < +/- 10%)								
Detection Setting								
Does Controller Properly Record Occupancy?								

11/22/2022

AVC Operations Test – Classification

Site: _____

Date: _____ Time: _____

Objective
Verify and demonstrate the functionality and accuracy of vehicle classification for the detector locations.

Prerequisites
Detector and cabinet installation must be complete. Lane must be open to traffic. NHDOT Inspector must be present during testing.

Access the Internet time (https://time.is/), which will be used as a reference of volume test.

Verify VSign Hub's time is the same as Internet time.

Knowledge of FHWA 13-vehicle class is required.

Test Equipment
A stopwatch, a traffic count board, and a laptop. An option is to use video camera to record videos. Under this case, there is a need to ensure the camera's clock is accurate enough (or write down the offset) compared to Internet time.

Success Criteria
Classifications obtained from each detector for each lane of traffic will be within +/- 10 percent of each sample size. Sample size will be at least 15 minutes and for the classification criteria see table below. Traffic will be running at typical free-flowing speed and condition.

Test Instructions
1. Record the observed actual hand count classifications and sensor counts for at least 15 minutes.
2. Record the classification of vehicles detected by the sensor over the test period.
3. Calculate the total volume by adding the hand counts of all classes together.
4. For each class, subtract hand count classification counts from detector count volume to obtain the misclassification volume. Then, divide the misclassification volume by the hand count classification count. Multiply by 100 to get the percent accuracy.
5. For each class, calculate its class weight, which is equal to hand count over the total volume.
6. Calculate the weight average of the accuracy, which is equal to the sum of each class's percent accuracy timing the weight of the class.
7. Indicate pass if the weighted average is +/- 10%.
8. Adjust detection settings and repeat if % accuracy is out of range.
9. If the system fail to pass, video recording may be required for further investigation.

Classification Measurements
FHWA Classification
Class 1
Class 2
Class 3
Class 4
Class 5
Class 6
Class 7
Class 8
Class 9
Class 10
Class 11
Class 12
Class 13

Use the chart on the next page to complete the test for each travel lane.

AVC: Classification Test Results									
Lane #		**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Time (min:sec)									
Start Time (hh:mm:ss)									
End Time (hh:mm:ss)									
Observed Classification Counts	Class 1								
	Class 2								
	Class 3								
	Class 4								
	Class 5								
	Class 6								
	Class 7								
	Class 8								
	Class 9								
	Class 10								
	Class 11								
	Class 12								
	Class 13								
Classification (From VSign)	Class 1								
	Class 2								
	Class 3								
	Class 4								
	Class 5								
	Class 6								
	Class 7								
	Class 8								
	Class 9								

	Class 10								
	Class 11								
	Class 12								
	Class 13								
% Accuracy = (Vsign - observed) / (observed)	Class 1								
	Class 2								
	Class 3								
	Class 4								
	Class 5								
	Class 6								
	Class 7								
	Class 8								
	Class 9								
	Class 10								
	Class 11								
	Class 12								
	Class 13								
Pass/Fail	Pass if weighed average < +/- 10%								
Sensitivity Setting									

Overall AVC Classification Test: ☐ Pass ☐ Fail

Inspector Name: _____ Organization: _____ Signature: _____

Witness Name: _____ Organization: _____ Signature: _____ Date: _____