TECHNICAL SPECIAL PROVISION

FOR

ITS DEVICE INTEGRATION AND TESTING

FINANCIAL PROJECT NO.: 435443-2-52-01

ORANGE COUNTY & SEMINOLE COUNTY

The official record of this Technical Special Provision has been electronically signed and sealed using a Digital Signature as required by Rule 61G 15-23.004, F.A.C. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

PREPARED BY:
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ARCADIS
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Date: 10/20/2015

T612 – ITS DEVICE INTEGRATION AND TESTING

T612-1 General.

Perform ITS device integration and testing based on the construction project milestones in accordance with the Contract Documents. All test equipment used will have valid calibration certifications in accordance with the manufacturer's recommendations, notwithstanding modification required for integration. The Department's active and tested ITS device configuration settings, firmware versions, and Sunguide configurations are provided on: www.cflsmartroads.com.

The Contractor will be responsible for conducting and documenting the test results. All equipment required for conducting tests will be supplied by the Contractor. The test will be conducted with manufacturer-supplied software or SunGuide® software as required. Provide qualified personnel to support the diagnosis and repair of system equipment during the tests as required. These personnel will be available for this support during tests. A Department representative will witness the test and sign the test results documentation at the end of each test confirming proof of attendance and concurrence with testing results. The Department reserves the right to postpone any test for up to seven days; such postponement will not be grounds for extension of completion time. The Department may waive its right to witness certain tests. Neither witnessing of the test(s) by the Department nor the waiving of the right to do so will relieve the contractor of the responsibility to comply with the contract documents. Such actions by the Department or approval of any test results by the Department will not be deemed as acceptance of the equipment or system tested until the successful completion of the 30-Calendar Day Operational Test Period.

Failure of any item to conform to the requirements for any test will be counted as a defect, and the equipment under test will be subject to test failure as determined by the Department. The Contractor may offer previously failed equipment for retest provided all areas of non-compliance have been corrected and retested, and evidence thereof is submitted and acceptable to the Department.

T612-2 ITS Device Integration and Testing Coordination.

The Contractor will provide to the Department all devices requiring integration 60 days prior to field implementation for the Department to review compatibility with Sunguide. If the device has a posted configuration settings, firmware versions, and Sunguide configurations on www.cflsmartroads.com and the device is to be integrated with this firmware then the 60 day requirement will be waived.

The Contractor will schedule a pre-integration meeting at least 14 calendar days prior to starting integration. The Contractor is responsible to provide all required information at the meeting. In the event the information is incomplete or inaccurate the meeting will be rescheduled with corrected information. Integration cannot proceed until a minimum of 14 calendar has elapsed following the complete and accurate submittal of required documents at a pre-integration meeting.

After all ITS devices of the same type are ready for testing, submit a written request to the Department's representative at least 14 calendar days prior to the proposed testing date. Conduct all tests in the presence of a Department representative. Testing will take place only on weekdays, unless Department allows the test to be conducted and/or continued on weekends and Department non-working

days.

After all ITS devices within each sub-system satisfactorily pass the required tests, submit a PDF document of the completed test with the documented test results, including signatures, to the Department for review within 14 days following completion of the tests.

T612-3 ITS Device Integration.

ITS components installed under the Project will be integrated by the Contractor. At the pre-integration meeting, the Contractor will provide a spreadsheet via native electronic file for all ITS device formatted as shown in Exhibit D burned on compact disk (CD).

The Department will add the project IP addressing scheme by device. The Contractor will adhere to the scheme when integrating ITS devices. All ITS devices will use a version of the NTCIP protocol compatible with the existing SunGuide® software platform. Ensure all ITS device protocols for each sub-system to be integrated with the SunGuide® Software are compliant with the protocols listed online at: http://sunguidesoftware.com/. The use of translators and/or protocol converters will not be allowed.

Perform any and all ITS device configuration changes/firmware upgrades required for the successful integration of all ITS devices installed with the existing communications system, Local Hubs, Master Hub Ethernet switches, and the SunGuide® Software. Provide the vendor equipment software for all types of ITS devices installed in the Project to the Department via disk with all applicable licensing.

The contract period will not be extended for time loss or delays related to integration or testing. Any integration or testing of the ITS components will be considered part of the component's installation. No additional compensation will be made.

T612-4 ITS Device Field Acceptance Testing (FAT).

Subject all ITS devices to a Field Acceptance Test (FAT) to demonstrate and document all stand-alone (non-network) functional operations of the ITS device and ancillary components, including accuracy as required. Perform all FAT tests and record all FAT results utilizing the Department approved testing procedures included in Exhibit A. FAT tests are to be performed for each ITS device type installed; at a minimum this will include: Microwave Vehicle Detection System (MVDS), Device Server (wired and wireless), and BlueTooth Vehicle Detection System. FAT will be completed prior to before any device is connected to the network.

If any ITS device or ancillary component fails to pass the FAT more than twice, it will be replaced with a new ITS device or ancillary component of same make and model, and the entire FAT will be repeated until proven successful.

T612-5 ITS Device Sub-System Acceptance Testing (S-SAT).

Subject all ITS devices to a Sub-Systems Acceptance Test (S-SAT) to demonstrate and document device operability from the nearest Department or Maintaining Agencies Master Hub via an Ethernet connection to the full layer 3 network switch. Perform all S-SAT tests and record all S-SAT results using the Department approved testing procedures Exhibit B. S-SAT tests are to be scheduled and performed for each ITS device sub-system (BlueTooth and VDS, etc.) after successful completion of the FAT for that sub-system, and after successful integration to the network.

At a minimum S-SAT test will be performed for the following ITS device sub-systems: MVDS.

T612-6 ITS Device System Acceptance Testing (SAT).

Subject all ITS devices to a Systems Acceptance Test (SAT) to demonstrate and document device operability from the SunGuide® Software and/or Regional Traffic Management Center (RTMC) workstation. Perform all SAT tests and record all SAT results using the Department approved testing procedures included in Exhibit C. SAT tests are to be scheduled and performed for each ITS device sub-system (BlueTooth, VDS, etc.) after successful completion of the FAT and S-SAT for that sub-system. At a minimum SAT test will be performed for the following ITS device sub-systems: Microwave Vehicle Detection System (MVDS), Device Server (wired and wireless), BlueTooth Vehicle Detection System. The SAT will exhibit full functionality of the ITS deployment in the SunGuide® software and/or the vendor supplied central software if available.

T612-7 30-Day Operational Test Period.

After successful completion of all required FAT, S-SAT, and SAT tests for all sub-systems, subject all ITS Devices to a 30-Calendar Day Operational Test Period (OTP), during which time the Contractor will perform any and all maintenance required to maintain a fully functional ITS system.

The Contractor will notify the Department in writing of the scheduled start date of the OTP 14 calendar days prior to the commencement of the OTP. The OTP will not be performed without prior written approval from the Department. The 30-Day OTP will consist of the monitoring of all ITS devices and ancillary components to ensure continuous operation without failure of any sub-system, ITS device, or ancillary component.

In the event of a sub-system, ITS device, or ancillary component failure causing a System Shutdown, the OTP Test will be terminated for purposes of testing and correcting identified deficiencies causing the System Shutdown. System Shutdown is defined as any condition which, due to work performed by the Contractor and/or its designee, results in the ITS device or ancillary component thereof to cease operation.

For each period of System Shutdown, and after the identified deficiency has been corrected and met all applicable tests, the OTP will be restarted for a new 30 consecutive calendar days starting upon confirmation the deficiency is resolved.

If the total number of System Shutdowns exceeds three due to the same sub-system, ITS device, or ancillary component, the Contractor will remove and replace the sub-system, ITS device or ancillary component with a new and unused unit subjecting it to all required tests including the FAT, S-SAT, and SAT. Upon written approval from the department, the restart the 30-day OTP will begin.

The OTP steps described herein will be repeated as many times as deemed necessary by the Department to satisfy the requirements of these Technical Special Provisions. The Contractor will not be granted time extensions to perform the OTP due to any failures as described herein. Correct any and all failures required to resume the OTP at no additional cost to the Department.

In the event a problem is discovered for which it is uncertain whether the cause is hardware or software related, the 30 calendar-day OTP will restart and repeat, unless otherwise directed by the Department. However, the OTP will not be deemed to have been successfully completed until the problem has been corrected.

All software required for diagnosing malfunctions of hardware and software/firmware will be supplied by the Contractor and approved by the Department prior to use. A copy of all diagnostic software will be submitted to the Department with full documentation within 14 days of deficiency resolution. Submit Failure Report Logs in demonstration that error rates are within requirements set herein.

T612-8 Physical Site and Network Access

Contractor will complete any and all required security access request forms formally requesting security clearance for physical site and network access to secure Department ITS hubs and networks. Site and network access will be required for all contractor and subcontractor personnel that need access to existing department ITS hubs and/or the ITS network for construction and testing, or other purposes. It is the contractor's responsibility to complete and submit the required security access request forms no less than 45 calendar days prior to needing access. The 45 calendar day security access request review period is required for Department review and related background security checks. The Department reserves at its sole discretion to grant or deny access to any software, hardware, site, etc.

T612-9 Basis of Payment

Price and payment for all work specified in this Technical Special Provision will be incidental to the ITS device pay items for which the testing is required.

No additional payment will be made.

DISTRICT FIVE

DEPARTMENT APPROVED

ITS DEVICE

FIELD ACCEPTANCE TEST (FAT)

TEST PROCEDURES

(EXHIBIT A)

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Date: 09/23/2015

Exhibit A Field Acceptance Test Procedures (FAT)

Utilize the following Department approved ITS device FAT testing procedures.

Exhibit A Section-1 Microwave Vehicle Detection System (MVDS)

Exhibit A Section-2 Device Server (Wired and Wireless)

Exhibit A Section-3 BlueTooth Vehicle Detection System

Exhibit A Section 1

1. Microwave Vehicle Detection System (MVDS)

Field Acceptance Test (FAT)

MVDS Name:_____ Local Hub: _____ Station: _____
MVDS Voltage Reading:_____
Manufacturer's Name: _____
Product Name: _____
Product Model Number: _____
Product Serial Number: _____
Product Firmware Version Number: _____
Terminal Server Model Number: _____
Terminal Server Serial Number: _____
Terminal Server Firmware Version: _____

To ensure proper VDS operation the following items will be used to conduct the test:

1) Manufacturer Supplied Sensor Software
2) Laptop Computer
3) 232 or 485 Interface Cable or Network Interface Cable
4) Calibrated Laser Radar Gun
5) Manual "clicker" counter (# as needed)

Step 1: Physical Verification
Visually verify all control cabinet equipment and cabling for proper installation. This includes verification that all power supply voltages and amperages to the devices are in the appropriate range.

Step 2: Establish Communication
Connect the Communications Cable from Laptop to the DB9 which is wired into the project approved surge suppression device. Refer to the VDS user guide for DB9 pin outs. Apply power to all devices and the Laptop; establish communication from the laptop to the device.

Step 3: Raw Data Collection

An MVDS Data Verification Sheet will be filled out for documentation of the vehicle volume and vehicle speed data observed in the field. This raw data will be used to calculate the necessary averages to prove the devices functionality.

Step 4: Vehicle Volume Accuracy Test

Step 4 will be used to verify proper volume detection. For this test, verify the detection intervals are set to report every 1 min. Minimum duration for each site test will be minimum of 15 minutes. Traffic volume will be reported using a manual "click" counter to monitor and count each vehicle per lane. This manual count will verify volume of traffic and ensure the proper vehicle detection is occurring, to the required 95% accuracy per direction of travel. Fill in the appropriate table on the data verification sheet.

Step 5: Vehicle Speed Accuracy Test
Step 5 will be used to verify proper speed detection. Two methods can be used for testing for speed.

TEST EQUIPMENT REQUIRED

1. One set of cabinet keys
2. Multi-meter (Calibration Date: _____)
3. Laptop Computer
4. MVDS Vendor Software
5. Tally Counters
6. Speed Detection Device (Calibration Date: _____)
7. Ethernet Cables

LHUB #:_____ MVDS #:_____ Serial #:_____ Date:_____.			
Step Number	**Procedure**	**Expected Results**	**Results/Comments**
1	Verify that physical construction, device connections to power sources, installation of cables and connections between all devices and the cabinet has been completed per the plans and specifications.	Physical construction, device connections, and installation of cables are installed per the plans and specifications.	Pass_____ Fail_____
2	Verify the quality and tightness of ground and surge protection connections.	Connections verified.	Pass_____ Fail_____
3	Verify and document proper input and output voltages from the power supply to the MVDS.	Input voltage to Power Supply is 120 VAC (±5V). Output voltage from Power Supply to MVDS is 24 VDC.	Pass_____ Fail_____ VAC in _____ VAC out _____
4	Using a laptop computer, establish communication with the MVDS using the vendor software via the Ethernet port on the device server or the RS 232 maintenance port in the NEMA enclosure for remote locations.	Communication is established between the laptop computer and the MVDS.	Pass_____ Fail_____
5	Click on Sensor Settings and document the serial number on the top of this page. Verify that the location information has been entered correctly.	Serial number is documented and the location information is entered correctly.	Pass_____ Fail_____
6	Verify that the Sensor Orientation has been set to the correct direction (N, S, E or W). Exit back to the main menu.	Sensor orientation is set to the direction that the senor is facing (N, S, E or W).	Pass_____ Fail_____

LHUB #:_____ MVDS #:_____ Serial #:_____ Date:_____.			
Step Number	**Procedure**	**Expected Results**	**Results/Comments**
7	Click on Data Setup & Collection then Interval Data and verify that the interval is set to 20 seconds.	Interval is set to 20 seconds.	Pass_____ Fail_____
8	Verify that the MVDS is storing data and is resetting every 20 seconds then exit back to the main menu.	MVDS is storing data and resetting every 20 seconds.	Pass_____ Fail_____
9	Click on Lane Setup then Sensor Alignment. Verify that the alignment arrow is green then exit back to the main menu.	Alignment arrow is green indicating that the MVDS is properly aligned.	Pass_____ Fail_____
10	Click on Lane Verification and verify that the intended lanes of detection and the volume & speed sidebars are displayed.	The intended lanes of detection and volume & speed sidebars are displayed.	Pass_____ Fail_____
11	Verify that each lane is displaying both volume and speed for each vehicle passing the MVDS.	Volume and Speed is displayed for each vehicle passing the MVDS.	Pass_____ Fail_____
12	Start the MVDS testing in accordance with the procedures outlined on the following pages.		

LHUB #:_____ MVDS #:_____ Serial #:_____ Date:_____.

Field Acceptance Tests

This test will verify vehicle detector functional operation at the field site. No connection to network is needed for the Field Acceptance Test.

Purpose: To verify that the vehicle detection device functions properly per FDOT Specification 786-5.2 – Field Acceptance Testing.

Objective: To Demonstrate that the vehicle detection device meets or exceeds the minimum requirements of the functional requirements.

Expected Results: The vehicle detection device will satisfy the functional requirements and the minimum performance accuracy as per the FDOT specification 660-2.2.1 Detection Accuracy. The Detection system will meet the following accuracy levels of:

Volume per Lane	≥ 95%
Speed per Lane	≥ 90%

Procedures:

Volume: Using trained personnel and tally counters; make a manual count of all vehicles in each lane for a period of 15 minutes or as needed to count a minimum of one hundred vehicles per lane. During the same time period, using the vendor software, start and stop the MVDS volume count. Record the results for each lane in the table below. Calculate the volume accuracy for each lane by determining the difference between the Manual and VDS count, divided by the Manual count, multiplied by 100. This is the percent difference. The percent difference will be 5% or less to pass this test. Only lanes with failing results will be retested.

Volume Test Period is approx. 15 minutes with a minimum of 100 vehicles per lane.

Lane Number:	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
MVDS Count:								
Manual Count:								
Difference (%):								

LHUB #:_____ **MVDS #:**_____ **Serial #:**_____ **Date:**_____.

Speed: Using a calibrated speed detection device, record speed data for a period of 15 minutes or 100 vehicles for each lane in the tables below. During the same time period, using the vendor software, start and stop the MVDS average speed count. Record the results for each lane in the tables below. *Calculate the speed accuracy for each lane by determining the difference between the Manual and MVDS average speeds, divided by the Manual average speed, multiplied by 100. This is the percent difference. The percent difference will be 10% or less to pass this test. Only lanes with failing results will be retested.

Pre-Test Items	Calibration Date	Verified By
Speed Detection Device		

Record speeds of all vehicles for 15 minutes or 100 vehicles per lane. **Lane #**

Total of all speeds_____ ÷ total vehicles____=_____Manual Average Speed

MVDS Average Speed___ Manual Average Speed_____ Difference* _____%

Record speeds of all vehicles for 15 minutes or 100 vehicles per lane. **Lane #**

Total of all speeds_____ ÷ total vehicles____=_____Manual Average Speed

MVDS Average Speed___ Manual Average Speed_____ Difference* _____%

LHUB #:_____ MVDS #:_____ Serial #:_____ Date:_____.

Record speeds of all vehicles for 15 minutes or 100 vehicles per lane. Lane #

Total of all speeds_____ ÷ total vehicles___=_____Manual Average Speed

MVDS Average Speed___ Manual Average Speed_____ Difference* _____%

Record speeds of all vehicles for 15 minutes or 100 vehicles per lane. Lane #

Total of all speeds_____ ÷ total vehicles___=_____Manual Average Speed

MVDS Average Speed___ Manual Average Speed_____ Difference* _____%

LHUB #:_____ MVDS #:_____ Serial #:_____ Date:_____.

Record speeds of all vehicles for 15 minutes or 100 vehicles per lane. Lane #

Total of all speeds_____ ÷ total vehicles____=_____Manual Average Speed

MVDS Average Speed___ Manual Average Speed_____ Difference* _____%

Record speeds of all vehicles for 15 minutes or 100 vehicles per lane. Lane #

Total of all speeds_____ ÷ total vehicles____=_____Manual Average Speed

MVDS Average Speed___ Manual Average Speed_____ Difference* _____%

LHUB #:_____ MVDS #:_____ Serial #:_____ Date:_____.

Record speeds of all vehicles for 15 minutes or 100 vehicles per lane. Lane #

Total of all speeds_____ ÷ total vehicles____=_____Manual Average Speed

MVDS Average Speed___ Manual Average Speed_____ Difference* _____%

Record speeds of all vehicles for 15 minutes or 100 vehicles per lane. Lane #

Total of all speeds_____ ÷ total vehicles____=_____Manual Average Speed

MVDS Average Speed___ Manual Average Speed_____ Difference* _____%

Volume per lane passed (95% accuracy) Yes____ No____
Speed per lane passed (90% accuracy) Yes___ No____
Field Acceptance VDS Test Passed Yes___ No____

2A. Device Server (Wired)

Field Acceptance Test (FAT)

Device Server Name:_____ Local Hub: _____ Station: _____
Device Server Voltage Reading:_____
Product Manufacturer's Name:_____
Product Make: _____
Product Model:_____
Product Serial Number:_____
Product Firmware Version Number:_____
Product IP Address:_____
Product Gateway:_____
Product Subnet Mask:_____

#	Pass	Fail	Test Operation
1	□	□	Verify that the installation of the device server is completed as shown in the plans.
2	□	□	Inspect the quality and tightness of ground and surge protector connections.
3	□	□	Ensure that the device server is configured with the correct IP address and site information (Referenced Exhibit C - IP Addressing Scheme).
4	□	□	Under Advanced Network Settings, verify that Probe Interval is set to 10 seconds, Probe Count is set to 5, Retransmission Timeout is 10 seconds.
5	□	□	Verify that TCP Keepalive is enabled with the following information: Idle Timeout = 0, hours = 0 and minutes = 30 seconds
6	□	□	Verify that the System description and contact information have been properly configured.
7	□	□	Verify that each individual port has been properly configured and labeled.
8	□	□	Verify that both RS-232 port and RS-485 inputs function properly using loopback testing or similar method.

Technician Name:_____ Technician Signature:_____

Date:_____ Device Serial Number:_____

Test Start Time:_____ Test Finish Time:_____

Test anomalies and comments (if applicable)_____

Department Rep. Name:_____ Department Rep. Signature:_____

2B. Device Server (Wireless)

Field Acceptance Test (FAT)

Device Server Name:_____ **Station:** _____
Device Server Voltage Reading:_____
Product Manufacturer's Name:_____
Product Make: _____
Product Model:_____
Product Serial Number:_____
Product Firmware Version Number:_____
Product IP Address:_____
Product Gateway:_____
Product Subnet Mask:_____

#	Pass	Fail	Test Operation
1	□	□	Verify that the installation of the wireless device server is completed as shown in the plans.
2	□	□	Inspect the quality and tightness of ground and surge protector connections.
3	□	□	Ensure that the device server is configured with the correct IP address and site information (Referenced Exhibit C - IP Addressing Scheme).
4	□	□	Under Advanced Network Settings, verify that Probe Interval is set to 10 seconds, Probe Count is set to 5, Retransmission Timeout is 10 seconds.
5	□	□	Verify that TCP Keepalive is enabled with the following information: Idle Timeout = 0, hours = 0 and minutes = 30 seconds
6	□	□	Verify that the System description and contact information have been properly configured.
7	□	□	Verify that each individual port has been properly configured and labeled.
8	□	□	Verify that the RS-232 port or RS-485 inputs function properly using loopback testing or similar method.
9	□	□	Verify that cellular antenna is properly installed and connected to the device server unit per the plans.
10	□	□	Verify that mobile interface of the unit is properly configured to support the cellular service provided by FDOT.
11	□	□	Verify that upload/download speed, latency and received cellular signal strength meet the minimum requirements described in the special provisions and recommended by the unit manufacturer.

Technician Name:_____ Technician Signature:_____

Date:_____ Device Serial Number:_____

Test Start Time:_____ Test Finish Time:_____

Test anomalies and comments (if applicable)_____

_____

_____

_____

Department Rep. Name:_____Department Rep. Signature:_____

3. BlueTooth Vehicle Detection System(VDS)

Field Acceptance Test (FAT)

BlueTooth VDS Name:_____ **Station:** _____
BlueTooth VDS Voltage Reading:_____
Product Manufacturer's Name:_____
Product Make: _____
Product Model:_____
Product Serial Number:_____
Product Firmware Version Number:_____
Product IP Address:_____
Product Gateway:_____
Product Subnet Mask:_____

#	Pass	Fail	Test Operation
1*	□	□	Verify that open view of the southern skies have been observed and a battery in each device is fully charged (for solar installations).
2*	□	□	Ensure that data and power cables from the pole or support structure to the BlueTooth VDS are routed inside the mounting hardware and protected from exposure to the outside environment.
3	□	□	Verify that physical construction of pole has been completed per plans and that BlueTooth VDS is securely fastened per vendor's recommendation.
4	□	□	Verify BlueTooth VDS power supply voltage output is within the operating voltage.
5*	□	□	Verify that received cellular signal strength meet the minimum requirements described in the special provisions and recommended by the BlueTooth VDS manufacturer.
6	□	□	Verify that the BlueTooth VDS IP address, network subnet mask and gateway have been configured properly in accordance with FDOT's assignment.
7	□	□	Confirm that all LEDs are normal in accordance with manufacturer's installation guide after proper configuration and installation.

***If Applicable**

Technician Name:_____ Technician Signature:_____

Date:_____ Device Serial Number:_____

Test Start Time:_____ Test Finish Time:_____

Test anomalies and comments (if applicable)_____

_____

_____

Department Rep. Name:_____ Department Rep. Signature:_____

DISTRICT FIVE

DEPARTMENT APPROVED

ITS DEVICE

SUB-SYSTEM ACCEPTANCE TEST (S-SAT)

TEST PROCEDURES

(EXHIBIT B)

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Date: 10/20/2015

Exhibit B Sub-System Test Procedures (S-SAT)

Utilize the following Department approved ITS device S-SAT testing procedures.

Exhibit B Section-1 Microwave Vehicle Detection System (MVDS)

1. Microwave Vehicle Detection System (MVDS)

Sub-System Acceptance Test (S-SAT)

MVDS Name:_____ **Station:** _____
MVDS Voltage Reading:_____
Manufacturer's Name: _____
Product Name: _____
Product Model Number: _____
Product Serial Number: _____
Product Firmware Version Number: _____
Terminal Server Model Number: _____
Terminal Server Serial Number: _____
Terminal Server Firmware Version: _____

Device Name:_____ IP Address:_____ Local Hub:_____

#	Pass	Fail	Test Operation
1	□	□	From an Ethernet connection at a connected Master Hub layer 3 network switch, connect the Laptop and establish communication from the laptop to the device.
2	□	□	With the Ethernet connection, use the MVDS system software to verify the MVDS Device name. Confirm the device name matches the plans and FAT test results.
3	□	□	With the Ethernet connection, use the MVDS system software to verify the number of lanes being detected. Confirm the number of lanes matches the FAT test results.
4	□	□	With the Ethernet connection, use the MVDS system software to verify speeds being detected. Confirm the speed being detected are typical highways speeds. If speeds are lower than expected, field verify to confirm and note the cause. Abnormal Speed Reason (i.e., Traffic Incident, N/A, etc):_____
5	□	□	From a cellular connection at a connected Master Hub layer 3 network switch, connect the Laptop and establish communication from the laptop to the device.
6	□	□	With the cellular connection, use the MVDS system software to verify the MVDS Device name. Confirm the device name matches the plans and FAT test results.
7	□	□	With the cellular connection, use the MVDS system software to verify the number of lanes being detected. Confirm the number of lanes matches the FAT test results.
8	□	□	With the cellular connection, use the MVDS system software to verify speeds being detected. Confirm the speed being detected are typical highways speeds. If speeds are lower than expected, field verify to confirm and note the cause. Abnormal Speed Reason (i.e., Traffic Incident, N/A, etc):_____

Note: Perform the applicable tests based on the communication mode.

Sub-System Acceptance Test Witness Signatures

Technician Name:_____ Technician Signature:_____

Date:_____ Device Serial Number:_____

Test Start Time:_____ Test Finish Time:_____

Test anomalies and comments (if applicable)_____

Department Rep. Name:_____ Department Rep. Signature:_____

DISTRICT FIVE

DEPARTMENT APPROVED

ITS DEVICE

SYSTEM ACCEPTANCE TEST (SAT)

TEST PROCEDURES

(EXHIBIT C)

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Date: 10/20/2015

Exhibit C System Acceptance Test Procedures (SAT)

Utilize the following Department approved ITS device SAT testing procedures.

Exhibit C Section-1 Microwave Vehicle Detection System (MVDS)

Exhibit C Section-2 BlueTooth Vehicle Detection System (VDS)

1. Microwave Vehicle Detection System (MVDS)

System Acceptance Test (SAT)

MVDS Name:_____Local Hub: _____ Station: _____
MVDS Voltage Reading:_____
Manufacturer's Name: _____
Product Name: _____
Product Model Number: _____
Product Serial Number: _____
Product Firmware Version Number: _____
Terminal Server Model Number: _____
Terminal Server Serial Number: _____
Terminal Server Firmware Version: _____

Device Name:_____ IP Address:_____ Local Hub:_____

#	Pass	Fail	Test Operation
1	□	□	Verify with SunGuide Operator that MVDS icon on the SunGuide Device Map appears Green.
2	□	□	Request SunGuide Operator to hover over the MVDS icon on the SunGuide Device Map to verify the VDS Device name. Confirm the device name matches the plans and FAT test results.
3	□	□	Verify with SunGuide Operator the number of lanes being detected by counting the number of green lines adjacent to the MVDS icon on the SunGuide Device Map. Confirm the number of lanes matches the FAT test results.
4	□	□	Request SunGuide Operator to hover over the MVDS icon on the SunGuide Device Map to verify speed being detected. Confirm the speed being detected matches the live video feed at this location (Typical Speed versus low speed).

System Acceptance Test Witness Signatures

Technician Name:_____ Technician Signature:_____

Date:_____ Device Serial Number:_____

Test Start Time:_____ Test Finish Time:_____

Test anomalies and comments (if applicable)_____

_____

_____

Department Rep. Name:_____Department Rep. Signature:_____

2. BlueTooth Vehicle Detection System (VDS)

System Acceptance Test (SAT)

BlueTooth VDS Name:_____ **Station:** _____
BlueTooth VDS Voltage Reading:_____
Product Manufacturer's Name:_____
Product Make: _____
Product Model:_____
Product Serial Number:_____
Product Firmware Version Number:_____
Product IP Address:_____
Product Gateway:_____
Product Subnet Mask:_____

#	Pass	Fail	Test Operation
1	□	□	Verify with TMC Operator that BlueTooth VDS icon on the vendor supplied Central Software Interface appears Green.
2	□	□	Confirm the device ID displayed on the vendor supplied Central Software Interface matches the FAT test results.
3	□	□	Verify with TMC Operator that the BlueTooth VDS voltage being detected by the system is displayed on the vendor supplied Central Software Interface. Confirm the voltage matches the FAT test results.
4	□	□	Verify with TMC Operator that the number of MAC addresses that hit the device has been displayed on the vendor supplied Central Software Interface.

System Acceptance Test Witness Signatures

Technician Name:_____ Technician Signature:_____

Date:_____ Device Serial Number:_____

Test Start Time:_____ Test Finish Time:_____

Test anomalies and comments (if applicable)_____

_____

_____

_____

_____

_____

Department Rep. Name:_____ Department Rep. Signature:_____