TECHNICAL SPECIAL PROVISION

FOR

ITS DEVICE INTEGRATION AND TESTING

FINANCIAL PROJECT NO.: 428213-2-52-02

MARION COUNTY

The official record of this Technical Special Provision is the electronic file signed and sealed under rule 61G 15-23.003, F.A.C.

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Date: 04/08/2015

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 shall 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 will be provided to the contractor by the Department and may be provided within the following website: www.cflsmartroads.com.

The Contractor shall be responsible for conducting and documenting the test results. All equipment required for conducting tests shall be supplied by the Contractor. The test shall 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 shall 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 shall 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 shall 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 shall 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 shall be counted as a defect, and the equipment under test shall 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 shall 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 the www.cflsmartroads.com website, then the 60 day requirement shall be waived. The 60 day requirement may also be waived at the Department's discretion.

The Contractor shall 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 shall 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 shall 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 shall be integrated by the Contractor. At the pre-integration meeting, the Contractor shall 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 shall adhere to the scheme when integrating ITS devices. All ITS devices shall 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 shall 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 shall not be extended for time loss or delays related to integration or testing. Any integration or testing of the ITS components shall be considered part of the component's installation. No additional compensation shall 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 shall include: Local Hub Ethernet Switch (LHES), Uninterruptable Power Supply (UPS), Device Server, Closed Circuit Television (CCTV), and Vehicle Detection System (VDS). FAT shall 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 shall be replaced with a new ITS device or ancillary component of same make and model, and the entire FAT shall 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 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 (CCTV, VDS, etc.) after successful completion of the FAT for that sub-system, and after successful integration to the network.

At a minimum SAT test shall be performed for the following ITS device sub-systems: Local Hub Ethernet Switch (LHES), Uninterruptable Power Supply, Device Server, Closed Circuit Television (CCTV), and Vehicle Detection System (VDS).

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 (CCTV, VDS, etc.) after successful completion of the FAT and S-SAT for that sub-system. At a minimum SAT test shall be performed for the following ITS device sub-systems: Local Hub Ethernet Switch (LHES), Uninterruptable Power Supply, Device Server, Closed Circuit Television (CCTV), and Vehicle Detection System (VDS). The SAT shall exhibit full functionality of the ITS deployment in the SunGuide® software.

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 shall perform any and all maintenance required to maintain a fully functional ITS system.

The D/B Firm shall 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 shall not be performed without prior written approval from the Department. The 30-Day OTP shall 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 shall 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 shall 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 shall 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 shall be repeated as many times as deemed necessary by the Department to satisfy the requirements of these Technical Special Provisions. The Contractor shall 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 shall restart and repeat, unless otherwise directed by the Department. However, the OTP shall 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 shall be supplied by the Contractor and approved by the Department prior to use. A copy of all diagnostic software shall 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 shall 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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Exhibit A Field Acceptance Test Procedures (FAT)
Utilize the following Department approved ITS device FAT testing procedures.

Exhibit A Section-1 Local Hub Ethernet Switch (LHES)

Exhibit A Section-2 Uninterruptible Power Supply (UPS)

Exhibit A Section-3 Closed Circuit Television Camera (CCTV)

Exhibit A Section-4 Vehicle Detection System (VDS)

Exhibit A Section-5 Device Server

1. Local Hub Ethernet Switch (LHES)

Field Acceptance Test (FAT)

LHES Device Name:_____**Local Hub:** _____ **Station:** _____
LHES 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	☐	☐	Ensure that all wiring complies with NEC requirements and standards.
2	☐	☐	Verify all connections, including correct installation of communication and power cables.
3	☐	☐	Verify Device Voltage is within operating voltage.
4	☐	☐	Verify CLI (Command Line Interface, Serial) and GUI (Graphic User Interface, Ethernet) are responding through Serial and Ethernet ports.
5	☐	☐	Verify System Identification Information matches approved scheme as specified on www.cflsmartroads.com *
6	☐	☐	Verify layer 3 license is activated.
7	☐	☐	Verify that standard port assignment convention is followed and all ports are labeled accordingly.
8	☐	☐	Verify LHES IP Address, Gateway, and Subnet Mask Match Approved IP List (Yes/No). IP Address:_____Gateway:_____Subnet Mask:_____
9	☐	☐	Verify firmware is same as specified on www.cflsmartroads.com *
10	☐	☐	Verify that correct VLAN's have been configured as directed by and coordinated with the department. *
11	☐	☐	Verify that correct IGMP multicast group has been configured as directed by and coordinated with the department. *
12	☐	☐	Verify SNMP and RADIUS or TACACS+ settings are as specified on www.cflsmartroads.com *
13	☐	☐	Verify communication to each device directly connected to LHES by initiating a ping.

*If Applicable

1. Local Hub Ethernet Switch (LHES) (Continued)

<u>Field Acceptance Test Witness Signatures</u>

Technician Name:_____   Technician Signature:_____

Date:_____   Device Serial Number:_____

Test Start Time:_____   Test Finish Time:_____

Test anomalies and comments (if applicable)_____

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Department Rep. Name:_____Department Rep. Signature:_____

2. Uninterruptible Power Supplies (UPS)

Field Acceptance Test (FAT)

UPS Device Name:_____**Local Hub:** _____ **Station:** _____
UPS 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 UPS is installed per the plans and in compliance with the NEC.
2	□	□	Verify all LED lights on the front panel interface are operational.
3	□	□	Verify proper voltage is provided from each output port.
4	□	□	Perform Self-Test on the UPS and verify there are no errors reported.
5	□	□	Verify proper voltage continues through output ports following disconnection from constant power source.
6	□	□	Verify that UPS is accessible through the web interface via Ethernet connection.
7	□	□	Verify UPS IP Address, Gateway, and Subnet Mask Match Approved IP List (Yes/No). IP Address:_____Gateway:_____Subnet Mask:_____
8	□	□	Verify that UPS has been configured with proper location name and system information.
9	□	□	Verify with a digital multi-meter the voltage of UPS batteries and compare with UPS display of battery voltage. Bat.#1:_____Bat.#2:_____Bat.#3:_____Bat.#4:_____
10	□	□	Turn off commercial power breaker in cabinet and verify that UPS power supports the functionality of all devices. Actual Time in Hours/Minutes:_____

2. Uninterruptible Power Supplies (UPS) (Continued)

Field Acceptance Test Witness Signatures

Technician Name:_____ Technician Signature:_____

Date:_____ Device Serial Number:_____

Test Start Time:_____ Test Finish Time:_____

Test anomalies and comments (if applicable)_____

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

3. Closed Circuit Television (CCTV) Cameras

Field Acceptance Test (FAT)

CCTV Name:_____ **Local Hub:** _____ **Station:** _____
CCTV 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 power supplies, local control equipment, and transient voltage surge suppressors are securely mounted in Device Cabinet.
2	□	□	Ensure that data and video cables from the pole or support structure to the camera are routed inside the mounting hardware and protected from exposure to the outside environment.
3	□	□	Verify that physical construction of pole and conduit inside pole has been completed per plans and that conduit (if applicable) is securely fastened.
4	□	□	Verify that the CCTV composite cable is fastened to the strain relief.
5	□	□	Verify the quality and tightness of ground and surge protector connections.
6	□	□	Verify CCTV power supply voltage output is within CCTV operating voltage.
7	□	□	Verify that the video signal from the camera is present and of consistent quality at all connection points between the camera, the cabinet and any video devices therein. Test fails if video is not viewable and clear via laptop at CCTV cabinet.
8	□	□	Verify that pan control is possible through laptop control software and that continuous pan "left" and pan "right" create a 360 degree field of view.
9	□	□	Verify that tilt is possible through laptop control software and that continuous tilt "up" and tilt "down" create a 110 degree field of view.
10	□	□	Verify that zoom is possible through laptop control software and that continuous zoom "in" and zoom "out" create a functional picture free of distortion.

3. Closed Circuit Television (CCTV) Cameras (Continued)

#	Pass	Fail	Test Operation
11	☐	☐	Verify that the appropriate CCTV video tags are configured per plans.
12	☐	☐	Verify that "auto iris" is set correctly through laptop control software and that view of dark and light areas auto adjust to correct iris settings.
13	☐	☐	Verify that Camera Lowering Device (CLD) lowers and raises without issue. . If no CLD, then Check N/A ☐
14	☐	☐	Verify that the Stainless Steel Aircraft Cable is installed or adjusted to the proper length as defined in the MG2 manual. Verify that there are no bents or kinks in the cable. If no CLD, then Check N/A ☐
15	☐	☐	After the lowering device test is complete verify that lower cable is attached to the parking stand. If no CLD, then Check N/A ☐

Field Acceptance Test Witness Signatures

Technician Name:_____   Technician Signature:_____

Date:_____   Device Serial Number:_____

Test Start Time:_____   Test Finish Time:_____

Test anomalies and comments (if applicable)_____

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Department Rep. Name:_____Department Rep. Signature:_____

4. *Vehicle Detection System (VDS)*

Field Acceptance Test (FAT)

VDS 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 shall 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 shall 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. VDS Vendor Software
5. Tally Counters
6. Speed Detection Device (Calibration Date: _____)
7. Ethernet Cables

LHUB #:_____ VDS #:_____ 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 VDS.	Input voltage to Power Supply is 120 VAC (±5V). Output voltage from Power Supply to VDS is 24 VDC.	Pass_____ Fail_____ VAC in _____ VAC out _____
4	Using a laptop computer, establish communication with the VDS 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 VDS.	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 #:_____ VDS #:_____ 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 VDS is storing data and is resetting every 20 seconds then exit back to the main menu.	VDS 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 VDS 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 VDS.	Volume and Speed is displayed for each vehicle passing the VDS.	Pass_____ Fail_____
12	Start the VDS testing in accordance with the procedures outlined on the following pages.		

| LHUB #:_____ | VDS #:_____ | Serial #:_____ | Date:_____. |

Field Acceptance Tests

This test shall 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 VDS 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 shall be 5% or less to pass this test. Only lanes with failing results shall 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
VDS Count:								
Manual Count:								
Difference (%):								

LHUB #:	VDS #:	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 VDS 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 VDS average speeds, divided by the Manual average speed, multiplied by 100. This is the percent difference. The percent difference shall be 10% or less to pass this test. Only lanes with failing results shall 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

VDS 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

VDS Average Speed_____ Manual Average Speed_____ Difference* _____%

LHUB #:_____ VDS #:_____ 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

VDS 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

VDS Average Speed_____ Manual Average Speed_____ Difference* _____%

LHUB #:_____ VDS #:_____ 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

VDS 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

VDS Average Speed_____ Manual Average Speed_____ Difference* _____ %

LHUB #:_____ VDS #:_____ 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

VDS 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

VDS 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____

5.   *Device Server*

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)_____

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Department Rep. Name:_____Department Rep. Signature:_____

DISTRICT FIVE

DEPARTMENT APPROVED

ITS DEVICE

SUB-SYSTEM ACCEPTANCE TEST (S-SAT)

TEST PROCEDURES

(EXHIBIT B)

PREPARED BY:
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Lake Mary, Florida 32746

Date: 04/08/2015

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

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

Exhibit B Section-1 Closed Circuit Television Camera (CCTV)

Exhibit B Section-2 Vehicle Detection System (VDS)

4. Closed Circuit Television (CCTV) Cameras

Sub-System Acceptance Test (S-SAT)

CCTV Name: _____ **Local Hub:** _____ **Station:**
CCTV 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	☐	☐	From an Ethernet connection at a connected Master Hub layer 3 network switch, verify that CCTV video can be displayed on a lap top by capturing and decoding the multi-cast stream. Test fails if video is not viewable and clear.
2	☐	☐	Verify that pan control is possible through laptop control software and that continuous pan "left" and pan "right" create a 360 degree field of view.
3	☐	☐	Verify that tilt is possible through laptop control software and that continuous tilt "up" and tilt "down" create a 110 degree field of view.
4	☐	☐	Verify that zoom is possible through laptop control software and that continuous zoom "in" and zoom "out" create a functional picture free of distortion.

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: _____

5. Vehicle Detection System (VDS)

Sub-System Acceptance Test (S-SAT)

VDS 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	☐	☐	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	☐	☐	Use the VDS system software to verify the VDS Device name. Confirm the device name matches the plans and FAT test results.
3	☐	☐	Use the VDS system software to verify the number of lanes being detected. Confirm the number of lanes matches the FAT test results.
4	☐	☐	Use the VDS 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): _____ _____

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)

PREPARED BY:
Robert Mastascusa, P.E
Fla. License No. 66600
Certificate of Authorization No. 2294

Metric Engineering
615 Crescent Executive Court Suite 524
Lake Mary, Florida 32746

Date: 04/08/2015

Exhibit C System Acceptance Test Procedures (SAT)
Utilize the following Department approved ITS device SAT testing procedures.

Exhibit C Section-1 Closed Circuit Television Camera (CCTV)

Exhibit C Section-2 Vehicle Detection System (VDS)

Exhibit C Section 1
5. Closed Circuit Television (CCTV) Cameras

System Acceptance Test (SAT)

CCTV Name:_____ **Local Hub:** _____ **Station:** _____
CCTV 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 CCTV video can be displayed on both SunGuide workstation monitors and video wall.
2	□	□	Verify that pan control is possible through SunGuide control software and that continuous pan "left" and pan "right" create a 360 degree field of view.
3	□	□	Verify that tilt is possible through SunGuide control software and that continuous tilt "up" and tilt "down" create a 110 degree field of view.
4	□	□	Verify that zoom is possible through SunGuide control software and that continuous zoom "in" and zoom "out" create a functional picture free of distortion.

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:_____

Exhibit C Section 2

2. Vehicle Detection System (VDS)

System Acceptance Test (SAT)

VDS 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 VDS icon on the SunGuide Device Map appears Green.
2	☐	☐	Request SunGuide Operator to hover over the VDS 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 VDS icon on the SunGuide Device Map. Confirm the number of lanes matches the FAT test results.
4	☐	☐	Request SunGuide Operator to hover over the VDS 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: _____