

TECHNICAL SPECIAL PROVISION

FOR

**ITS/ATMS DEVICE INTEGRATION AND
TESTING**

FINANCIAL PROJECT NO.: 440900-1-52-01/440900-2-52-01

SUMTER AND MARION COUNTIES

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Date: 12/18/2018

T612 – ITS/ATMS DEVICE INTEGRATION AND TESTING

T612-1 General.

Perform ITS/ATMS device integration and testing based on the construction project milestones in accordance with the Contract Documents. Note that ITS/ATMS includes all CV devices. All test equipment used must have valid calibration certifications in accordance with the manufacturer's recommendations, notwithstanding modification required for integration. The Department's/Maintaining Agency(s) active and tested ITS/ATMS device configuration settings, firmware versions, ATMS and Sunguide configurations will be provided to the contractor by the Department and may be provided within the following website: www.cflsmartroads.com.

Be responsible for conducting and documenting the test results. All equipment required for conducting tests must be supplied by the Contractor. The test must be conducted with manufacturer-supplied software, ATMS 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 must 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 120-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. Previously failed equipment may be offered 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/ATMS Device Testing Coordination.

Provide to the Department all devices requiring integration 60 days prior to submitting submittal data for approval. The Department will review compatibility with Sunguide and/or the ATMS system. If the device has a posted configuration settings, firmware versions, and Sunguide configurations on the www.cflsmartroads.com website, then the 60 day requirement can be waived. The 60 day requirement may also be waived at the Department's discretion.

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 must take place only on weekdays, unless the 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/ATMS devices will be configured and integrated by the Department. Provide all configurable devices to the Department for configuration 60 days prior to installation in the field. The Department will take ownership of the devices until the configuration is complete. However, all required technical support is to be provided to ensure an appropriately configured device (Up to and including field visits, firmware upgrades, configuration tools, etc.). Upon completion of the configuration, the Department will return ownership back to the Contractor.

All ITS devices must 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/>. Ensure all ATMS device protocols for use of each sub-system to be integrated into the ATMS software are fully functional. The use of translators and/or protocol converters are not allowed.

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

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

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

Subject all ITS/ATMS devices to a Field Acceptance Test (FAT) to demonstrate and document all stand-alone (non-network) functional operations of the ITS/ATMS 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/ATMS device type installed; at a minimum this shall include: Road Side Unit (RSU), Local Hub Ethernet Switch (LHES), Uninterruptable Power Supply (UPS), Power Distribution Unit (PDU), Bluetooth Device, Cellular Modem, Traffic Signal Controller, MMU, and Closed-Circuit Television (CCTV). All equipment required for completing the FAT shall be provided, including but not limited to an On-Board Unit (OBU). The FAT must be completed prior to any device being connected to the network.

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

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

The Department shall be responsible for S-SAT testing during the 120-day operational test period after the completion of the project.

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

The Department shall be responsible for SAT testing during the 120-day operational test period after the completion of the project.

T612-7 120-Day Operational Test Period (OTP).

After successful completion of all required FAT tests for all sub-systems, subject all ITS/ATMS Devices to a 120-Calendar Day Operational Test Period (OTP), during which time the Contractor must perform any and all maintenance required to maintain a fully functional ITS/ATMS system, including the initial site review if an issue is reported.

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 must not be performed without prior written approval from the Department.

In the event a problem is discovered for which it is uncertain whether the cause is hardware or software related, the 120 calendar-day OTP must restart and repeat, unless otherwise directed by the Department. However, the OTP must 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 must be supplied and approved by the Department prior to use. A copy of all diagnostic software must 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.

The OTP steps described herein must 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.

T612-8 Physical Site and Network Access

Complete any and all required security access request forms formally requesting security clearance for physical site and network access to secure Department ITS/ATMS hubs and networks. Site and network access will be required for all contractor and subcontractor personnel that need access to existing ITS/ATMS hubs and/or the ITS/ATMS 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/ATMS device FAT testing procedures.

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

Exhibit A Section – 2 Uninterruptible Power Supply (UPS) - Relocated

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

Exhibit A Section – 4 Roadside Unit (RSU)

Exhibit A Section – 5 Bluetooth (BT) Device

Exhibit A Section – 6 Power Distribution Unit (PDU) - PENDING

Exhibit A Section – 7 Ethernet Cellular Modem - PENDING

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

***If Applicable**

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	<input type="checkbox"/>	<input type="checkbox"/>	Verify UPS is installed per the plans and in compliance with the NEC.
2	<input type="checkbox"/>	<input type="checkbox"/>	Verify all LED lights on the front panel interface are operational.
3	<input type="checkbox"/>	<input type="checkbox"/>	Verify proper voltage is provided from each output port.
4	<input type="checkbox"/>	<input type="checkbox"/>	Perform Self-Test on the UPS and verify there are no errors reported.
5	<input type="checkbox"/>	<input type="checkbox"/>	Verify proper voltage continues through output ports following disconnection from constant power source.
6	<input type="checkbox"/>	<input type="checkbox"/>	Verify that UPS is accessible through the web interface via Ethernet connection.
7	<input type="checkbox"/>	<input type="checkbox"/>	Verify UPS IP Address, Gateway, and Subnet Mask Match Approved IP List (Yes/No). IP Address: _____ Gateway: _____ Subnet Mask: _____
8	<input type="checkbox"/>	<input type="checkbox"/>	Verify that UPS has been configured with proper location name and system information.
9	<input type="checkbox"/>	<input type="checkbox"/>	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	<input type="checkbox"/>	<input type="checkbox"/>	Turn off commercial power breaker in cabinet and verify that UPS power supports the functionality of all devices. Actual Time in Hours/Minutes: _____ _____

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	<input type="checkbox"/>	<input type="checkbox"/>	Verify that power supplies, local control equipment, and transient voltage surge suppressors are securely mounted in Device Cabinet.
2	<input type="checkbox"/>	<input type="checkbox"/>	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	<input type="checkbox"/>	<input type="checkbox"/>	Verify that physical construction of pole and conduit inside pole has been completed per plans and that conduit (if applicable) is securely fastened.
4	<input type="checkbox"/>	<input type="checkbox"/>	Verify that the CCTV composite cable is fastened to the strain relief.
5	<input type="checkbox"/>	<input type="checkbox"/>	Verify the quality and tightness of ground and surge protector connections.
6	<input type="checkbox"/>	<input type="checkbox"/>	Verify CCTV power supply voltage output is within CCTV operating voltage.
7	<input type="checkbox"/>	<input type="checkbox"/>	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	<input type="checkbox"/>	<input type="checkbox"/>	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	<input type="checkbox"/>	<input type="checkbox"/>	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	<input type="checkbox"/>	<input type="checkbox"/>	Verify that zoom is possible through laptop control software and that continuous zoom "in" and zoom "out" create a functional picture free of distortion.

Exhibit A Section 4

4. Roadside Unit (RSU)

Field Acceptance Test (FAT)

RSU Name: _____ Local Hub: _____ Station: _____
 RSU 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: _____

LHUB: _____		RSU SERIAL #: _____	
Step Number	Procedure	Expected Results	Results/Comments
1	Ensure all RSU are installed in accordance with the contract documents, manufacturers recommendations, and as directed by the Engineer.	RSU's are installed per the plans and specifications.	Pass___ Fail___
2	Ensure all DSRC Antennas, GPS Antennas, and B/T Antennas are installed per manufacturers documentation.	All Antennas are installed per manufacturers documentation.	Pass___ Fail___
3	Verify RSU has appropriate FCC Licensing, documentation, and is clearly marked on the RSU with an FCC Sticker.	RSU is licensed by the FCC with the supporting documentation and is clearly marked on the unit.	Pass___ Fail___
4	Ensure surge protection of the Omni Directional DSRC Antennas as well as the GPS Antennas in accordance with contract documents and Section 620.	Omni Directional and GPS Antennas are properly grounded per contract documents and Section 620.	Pass___ Fail___
5	Inspect the quality and tightness of ground and surge protector connections.	All connections are properly secured and tightened.	Pass___ Fail___
6	Verify all connections, including correct installation of communication and power cables.	All connections are correct.	Pass___ Fail___
7	Verify the SPD is installed, wired correctly, and grounded in the cabinet/LHUB per plan details.	SPD is installed correctly and grounded in the cabinet/LHUB.	Pass___ Fail___
8	Verify Power over Ethernet Injector (PoE) has been installed correctly per	Power over Ethernet Injector (PoE) has been installed per	Pass___ Fail___

LHUB:		RSU SERIAL #:	
Step Number	Procedure	Expected Results	Results/Comments
	the plan details in the cabinet/LHUB.	plan details.	
9	Verify the input of the Power over Ethernet Injector (PoE) is 120VAC and the output is 48VDC.	Input of the PoE _____ Output of the PoE _____	Pass___ Fail___
10	Power up the RSU by plugging in the POE Ethernet Cable to the appropriate LAN Port.	Indicator lights up "Green"	Pass___ Fail___
11	Establish communication with the RSU by using a laptop and either ping the device through a Secured Shell or Graphical User Interface (GUI).	Communication has been established with the unit. RSU responds with a ping reply.	Pass___ Fail___
12	Through the Graphical User Interface (GUI) ensure all network interfaces are configured correctly, based on the approved FDOT IP Schema, with the proper IP's.	Network interfaces are correctly configured based on the approved FDOT IP Schema.	Pass___ Fail___
13	Through the Graphical User Interface (GUI) ensure all device configurations, installed by the Contractor, are properly configured per location.	RSU is properly configured per location.	Pass___ Fail___
14	Verify through the Graphical User Interface (GUI) that the appropriate MAP and TIM Messages are installed in "Store and Repeat" Mode.	RSU has the proper messages and is programmed for "Store and Repeat"	Pass___ Fail___
15	Ensure the correct MAP Message has been installed per location and has been verified accurate.	MAP message has been installed and is verified for accuracy.	Pass___ Fail___
16	Where applicable, verify all SPaT configuration is correct within the RSU.	SPaT configuration has been properly configured in the RSU.	Pass___ Fail___
17	Where applicable, verify all SPaT configuration is correct within the signal controller.	SPaT configuration has been properly configured in the signal controller.	Pass___ Fail___
18	Using a Multi Chanel Tool or 5.9 GHZ DSRC Sniffer, verify all J2735 messages are being broadcasted by the RSU and received by the testing tool.	Receiving all J2735 messages being broadcasted by the RSU.	Pass___ Fail___
19	Verify security certificates are being broadcasted by the RSU with a Multi Chanel Tool or 5.9 GHZ DSRC Sniffer.	Security Certificates are being broadcasted by the RSU and received by the Multi Chanel Tool or 5.9 GHZ DSRC Sniffer.	Pass___ Fail___
20	Turn on and off the security certificates and verify the J2735 payload cannot be decoded, when security is off, by using the Multi Chanel Tool or 5.9 GHZ DSRC Sniffer.	With security off the J2735 payload cannot be decoded.	Pass___ Fail___

Exhibit A Section 5

5. BlueTooth (BT) Device

Field Acceptance Test (FAT)

BlueTooth Name: _____ **Local Hub:** _____ **Station:** _____
BlueTooth 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: _____

LHUB: _____		BLUETOOTH READER SERIAL #:	
Step Number	Procedure	Expected Results	Results/Comments
1	Confirm BT Antenna is properly connected to the Reader.	Antenna cable should be firmly connected to reader.	Pass ___ Fail ___
2	Confirm BT Antenna Alignment & Height. Confirm the Bluetooth Pole and Reader are installed per the plans and specifications. Confirm the Bluetooth Antenna is installed according to the ITS plan set and manufacturer's recommended height. The Technician shall verify there is a clear pathway for the Antenna to see across all travel lanes, as applicable to the directions of travel being observed (i.e. median clearing, elevated highway, etc.).	The Bluetooth Reader are installed per the plans and specifications. The Antenna should be able to see across all travel lanes.	Pass ___ Fail ___
3	The Technician shall use the Laptop to connect to the BT Browser based application locally with its assigned IP address. The Inspector shall use the Command Prompt and ping the Lonestar server and any other accessible remote site.	Browser Application should be accessible locally and Bluetooth Reader should receive an ICMP confirmation from the Lonestar server.	Pass ___ Fail ___
4	Ensure the BT unit can read MAC addresses from Bluetooth Enabled devices.	Bluetooth unit will read and display MAC addresses from Bluetooth enabled devices.	Pass ___ Fail ___
5	Confirm the frequency range is between 2.402-2.48 GHz.	Confirm the frequency range is between 2.402-2.48 GHz by referencing datasheet of spectrum analysis.	Pass ___ Fail ___

LHUB:		BLUETOOTH READER SERIAL #:	
Step Number	Procedure	Expected Results	Results/Comments
6	Confirm there is a seamless restart to the BT Reader devices upon a simulated power failure. The Technician shall disconnect the antenna cable and confirm the loss of connection with device. Reconnect the antenna cable.	The device should be back online and streaming data upon restoration of power.	Pass___ Fail___
7	The Technician shall use the Laptop to connect to the Bluetooth Browser based application and verify lane information.	The software should show the proper number of lanes being detected, as applicable to the installation location.	Pass___ Fail___
8	The Technician shall note the MAC Address of the BT test device (Bluetooth Vehicle/Cellphone). The Bluetooth reader shall be able to detect and read the MAC addresses of BT equipped vehicles or devices circulating along the I 75 in each respective direction of travel when passing next to the antenna. The Bluetooth Browser based application shall be accessed and confirm the Test device's MAC Address shall be observed in the software.	The BT test device MAC address should match the MAC address located within the reader range of 300 feet prior to the BT reader in each applicable direction of travel.	Test MAC Address: _____ Time stamp _____ Pass___ Fail___
9	The Technician shall use the Laptop to connect to the Bluetooth Browser based application locally with its assigned IP address. The software shall be used to show the data logging and statistics of the local reader. Record the results of all data values currently being processed by the Reader.	Number of Macs Addresses Read_____ Current Voltage_____ Average Voltage_____ Temperature_____ Sensitivity_____ Transmit Power_____	Pass___ Fail___
10	Ensure the unit can read no less than 90% of all MAC addresses located with a 300 ft. radius.	Count the number of possible Bluetooth enabled devices for one minute. Divide number of possible Bluetooth enabled devices by manual count. Count should be within 90%.	Pass___ Fail___

