

FLASHING BEACON CONTROLLER (FBC) TEST PLANS

1. DEVICE NAMING COORDINATION

- 1.1. The System Integrator shall coordinate with the TMC/ROC to identify the device names for each device.
- 1.2. The System Integrator shall then send a request to TOTS to identify the network name, IP address, and any pertinent configuration information.

2. EXPLANATION – STANDALONE (SALT) TESTING

- 2.1. The System Integrator shall work with the DEVICE VENDOR (if required by the testing form) and complete the NDOT specified SALT tests (non-network) on each unit of equipment after installation.
- 2.2. Conduct SALT testing on each unit of equipment as outlined on the NDOT provided testing form.
- 2.3. The System Integrator shall coordinate through the Resident Engineer and the Construction Crew to have an appropriate NDOT representative present for the onsite inspection.
- 2.4. The System Integrator shall submit the DEVICE vendor commissioning documents with the SALT testing to the Engineer for review and approval.
- 2.5. Supply a bucket truck and operator, or suitable equivalent equipment necessary to carry out procedures as required by the testing documents, at no direct payment.

FLASHING BEACON CONTROLLER (FBC) SALT PROCEDURE

TEST #	SALT TEST PROCEDURE	EXPECTED RESULT	PASS / FAIL
FBC Name:		IP Address:	GPS:
TOTS Network Name:		Associated Cabinet Name:	
<i>Purpose and General Verification</i>			
<p>System Integrator: This SALT tests the proper installation of a functional FBC. The system integrator will use a laptop to perform this test. Using the manufacture's software, the integrator will be able to verify the FBC is operational.</p> <p>General Verification: For each test below, complete the FBC SALT Matrix, circling the "Pass" or "Fail" in the appropriate cell. Only indicate a "Pass" on this form if the entire matrix column related to the tested function passes for EACH FBC being tested.</p>			
<i>System FBC Information</i>			
1.	Verify FBC Information using the manufacturer software or device label.	Manufacturer: _____ Model: _____ Serial Number: _____ Firmware Ver: _____	Pass / Fail
<i>Equipment Verification</i>			
2.	Verify FBC is securely mounted in cabinet.	FBC is securely mounted in cabinet.	Pass / Fail
3.	Using a meter, verify the system is properly bonded to earth ground.	Meter reading of 5 Ohms or less.	Pass / Fail
4.	Verify Ethernet cable length does not exceed 328 feet from the FBC to the PoE++ injector or PoE++ switch, using either a time domain reflectometer or beginning- and end-foot markers.	The Ethernet cable length is less than 328 feet. Cable Length: _____	Pass / Fail
5.	Verify power supply energizes the system.	System is energized.	Pass / Fail
6.	Verify all cabling is labeled with the to/from on each end and at any major transition point and is neatly managed throughout the cabinet.	All premise or inside plant cables originating and ending in the cabinet are properly terminated and labeled. Labeling material rated for Outside Plant (OSP) use. Cables are neatly managed using adjustable hook-and-loop fastener straps.	Pass / Fail
7.	Verify FBC is set to FAST Protocol.	FBC is set in FAST protocol.	Pass / Fail
8.	Verify FBC to "input" configuration is set to enable/disabled depending on application.	FBC is setup for "input" enable/disable based on application.	Pass / Fail

9.	Verify FBC is accessible via Web User Interface (UI).	FBC accessible via Web User Interface (UI).	Pass / Fail
10.	Verify FBC system operations locally via Web User Interface (UI).	FBC system turns on/off via Web User Interface (UI).	Pass / Fail
11.	Verify FBC will respond to FAST commands.	FBC responds to commands. System turns "on" when prompted to turn on. System turns "off" when prompted to turn off.	Pass / Fail
12.	Using manufacturer's software issue command to actuate the field device.	Visual confirmation of field device activation.	Pass / Fail
13.	Using manufacturer's software issue command to de-actuate the field device.	Visual confirmation of field device deactivation.	Pass / Fail
14.	Activate the local field device using manual actuator bypass.	Visual confirmation that FBC or field software successfully reads status of manual actuation.	Pass / Fail
15.	Deactivate the local field device using manual actuator bypass.	Visual confirmation that FBC or field software successfully reads status of manual de-actuation.	Pass / Fail

Verification of Settings

16.	Verify Communication Settings are set to appropriate values per the IP plan.	IP: _____ MASK: _____ GATEWAY: _____ UDP/TCP PORT: _____	Pass / Fail
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Signatures

DATE	AGENCY/FIRM	PERFORMED BY (Print Name) (Integrator)	INTL	AGENCY/FIRM	WITNESSED BY (Print Name) (NDOT)	INTL
Integrator Signature						
NDOT Signature						

3. **EXPLANATION - SUBSYSTEM (SST) TESTING**

- 3.1. At the beginning of the SST phase, the System Integrator shall submit, in PDF format and original signed hard copies of the certified SALT results for approval by the Engineer.
- 3.2. The Engineer shall approve all SALT testing prior to the System Integrator starting the SST testing.
- 3.3. Conduct SST testing in accordance with NDOT's testing documentation for all field and related equipment once the system has been interconnected to form a complete subsystem (i.e. Network connectivity).
- 3.4. The SST test shall demonstrate connectivity to all field equipment utilizing NDOT's current freeway management system (FMS).
- 3.5. The SST test consists of a 45-day period of operations without major failure of equipment. The Resident Engineer can require the SST be restarted if any major failure occurs. A major failure for the Flashing Beacon Controller is defined as:
 - 3.5.1. Any failure of the equipment associated with the PRIMARY FUNCTION of the Flashing Beacon Controller.
- 3.6. Demonstrate that the total system (hardware, firmware, software, materials, and construction) are properly installed, free from problems, exhibits stable and reliable performance, and meets project requirements.
- 3.7. Once per week, the System Integrator shall demonstrate that all system functions tested in the SST are operational and meets requirements.
- 3.8. The System Integrator shall coordinate through the Resident Engineer and the Construction Crew to have an appropriate NDOT representative present for the onsite inspection.
- 3.9. The System Integrator must provide proof that each device has been tested each week for the duration of the testing period witnessed by an NDOT representative.
- 3.10. The testing time must be scheduled a minimum of one week prior and coordinated and approved by the Resident Engineer and the Construction Crew.

FLASHING BEACON CONTROLLER (FBC) SST PROCEDURE

TEST #	SST TEST PROCEDURE	EXPECTED RESULT	PASS / FAIL
FBC Name:		IP Address:	GPS:
TOTS Network Name:		Associated Cabinet Name:	
<i>Purpose and General Verification</i>			
<p>System Integrator: This SST tests the proper installation of a functional FBC. The system integrator will use an Operator Workstation at the TMC/ROC to perform this test.</p> <p>General Verification: For each test below, complete the FBC SST Matrix, circling the "Pass" or "Fail" in the appropriate cell. Only indicate a "Pass" on this form if the entire matrix column related to the tested function passes for EACH FBC being tested.</p>			
<i>System FBC Information</i>			
1.	Verify network connectivity by issuing a ping test.	FBC responds to the ping test.	Pass / Fail
2.	Verify system turns on by issuing a command to turn "on" the system through the Freeway Management System (FMS).	System responds and turns on.	Pass / Fail
3.	Verify field device operation with system turned on from TMC/ROC.	Visual confirmation of field device activation.	Pass / Fail
4.	Verify system turns off by issuing a command to turn "off" the system through the Freeway Management System (FMS).	System responds and turns off.	Pass / Fail
5.	Verify field device operation with system turned off from TMC/ROC.	Visual confirmation of field device deactivation.	Pass / Fail
6.	Verify access to the Web User Interface (UI) from the TMC/ROC.	Web User Interface (UI) is accessible.	Pass / Fail
7.	Verify control of the system via the Web User Interface (UI) by the "output" interface. Test by switching the output to "on" and again by turning it "off".	FBC can control the system via the Web User Interface (UI).	Pass / Fail
8.	Using Web User Interface (UI) issue command to actuate the field device.	Visual confirmation of field device activation.	Pass / Fail
9.	Using Web User Interface (UI) issue command to de-actuate the field device.	Visual confirmation of field device deactivation.	Pass / Fail
10.	Activate the local field device using manual actuator bypass.	Visual confirmation that Freeway Management Software (FMS) at the TMC/ROC successfully reads status of manual actuation.	Pass / Fail

TEST #	SST TEST PROCEDURE		EXPECTED RESULT		PASS / FAIL
11.	Deactivate the local field device using manual actuator bypass.		Visual confirmation that Freeway Management Software (FMS) at the TMC/ROC successfully reads status of manual de-actuation.		Pass / Fail
<i>Signatures</i>					
SST DAY	DATE	PERFORMED BY (Print Name) (Integrator)	INTL	WITNESSED BY (Print Name) (NDOT)	INTL
1					
8					
15					
22					
29					
36					
45					
Integrator Signature					
NDOT Signature					