



## Automatic Transfer Switches Functional Performance Test

Equipment ID	[Equipment ID]
Building	[Building]
Location	[Room]

### System Description

Description:

Operational Assumptions:

Initial Test	Start Date	End Date	Initials
Results (Check one) <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> Partial Test w/Corrective Actions <input type="checkbox"/> Complete Test w/Corrective Actions <input type="checkbox"/> Other	Explanation:		

Re-Test 1	Start Date	End Date	Initials
Results (Check one) <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> Partial Test w/Corrective Actions <input type="checkbox"/> Complete Test w/Corrective Actions <input type="checkbox"/> Other	Explanation:		

Re-Test 2	Start Date	End Date	Initials
Results (Check one) <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> Partial Test w/Corrective Actions <input type="checkbox"/> Complete Test w/Corrective Actions <input type="checkbox"/> Other	Explanation:		



Deferred/Seasonal Test	Start Date	End Date	Initials
Results (Check one) <input type="checkbox"/> Pass <input type="checkbox"/> Fail <input type="checkbox"/> Partial Test w/Corrective Actions <input type="checkbox"/> Complete Test w/Corrective Actions <input type="checkbox"/> Other	Explanation:		

## Test Participants

Organization	Required	Optional
General Contractor	<input type="checkbox"/>	<input type="checkbox"/>
Mechanical Contractor	<input type="checkbox"/>	<input type="checkbox"/>
Electrical Contractor	<input type="checkbox"/>	<input type="checkbox"/>
TAB Contractor	<input type="checkbox"/>	<input type="checkbox"/>
Controls Contractor	<input type="checkbox"/>	<input type="checkbox"/>
Owner's O&M Personnel	<input type="checkbox"/>	<input type="checkbox"/>

## Test Equipment Required (to be provided by the Contractor)

Test Name	Equipment Description
Bolt Torque	Calibrated torque wrench
Bolted Connection or Contact Resistance	Four-probe Digital Low Resistance Ohmmeter (DLRO)
Voltage/Continuity	DVM
Insulation Resistance	Battery or line-powered (Hand-crank not acceptable).
Relay Operation	Variable AC Voltage source

## System Readiness Summary Checklist

Description	Yes	No	Date
System Ready for Test	<input type="checkbox"/>	<input type="checkbox"/>	
Required Personnel Available	<input type="checkbox"/>	<input type="checkbox"/>	
Required Tools/Test Equipment/Supplies Available	<input type="checkbox"/>	<input type="checkbox"/>	
Required Safety Equipment Available	<input type="checkbox"/>	<input type="checkbox"/>	

**Functional Performance Test --** (Verify all components are ready before energizing or operating the system.)

The Commissioning Authority will make and document any changes/addition/deletions to this test procedure required by current system conditions (i.e. weather, system load, utility availability, etc.).

R = Retest (Check (✓) retest required)

C = Corrected (Check (✓) when correction verified)

Y = Checked and Passed

N = Not Passed

ACTION	REQUIRED REACTION	Y (✓)	N (✓)	COMMENTS	R (✓)	C (✓)
<b>PRE-TEST VISUAL MECHANICAL INSPECTION</b>						
1. Safe conditions (protective gear in- place, available & procedures observed)		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		
				Initial	Date	
2. Confirm that NORMAL and EMERGENCY sources match final design drawings.	Normal: MDS.	<input type="checkbox"/>	<input type="checkbox"/>	Source: Normal: _____	<input type="checkbox"/>	<input type="checkbox"/>
	Emergency: EDP.	<input type="checkbox"/>	<input type="checkbox"/>	Emergency: _____	<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		
				Initial	Date	
3. Verify equipment nameplate data matches one-line drawings, specifications, and/or shop drawings and record date on attached table.	Volts:_____.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	Amps:_____.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	4 pole, 4W.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	Frequency: 60hZ.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	Interrupting Rating:_____.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	Enclosure:_____.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		
				Initial	Date	



ACTION	REQUIRED REACTION	Y (✓)	N (✓)	COMMENTS	R (✓)	C (✓)
4. Verify permanent labels for transfer switch is installed.	Melamine plastic laminate, minimum 1/16" thick.	<input type="checkbox"/>	<input type="checkbox"/>	Spec Section 16075	<input type="checkbox"/>	<input type="checkbox"/>
	Black letters on white face.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	Secured with self tapping, stainless-steel (SS) screws or SS machine screws with nuts and flat and lock washers.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		
				Initial	Date	
5. Verify accessibility for maintenance.	Door opens freely and swings fully open.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	3'-6" minimum clearance in front of switch.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	Cables do not block access to indicators or adjustable components.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	Cables do not block access to manual transfer switch operator.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		
				Initial	Date	
6. Inspect physical and mechanical conditions.	No visible signs of damage.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	No visible dirt, metal chips or contamination.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	Appropriate source indicating lights are illuminated.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>



ACTION	REQUIRED REACTION	Y (✓)	N (✓)	COMMENTS	R (✓)	C (✓)
Record issues				Issue Log Item:		
				Initial	Date	
7. Verify anchoring.	Anchor bolts are provided in locations shown on manufacturer's drawings.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		
				Initial	Date	
8. Verify the barriers and arc chutes are properly installed around contacts.	Barriers partially surround ATS contacts and are insulated.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	Arc chutes are installed around the contacts.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		
				Initial	Date	
9. Verify ATS is properly grounded.	Enclosure bonded to ground bus.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	Incoming (normal and emergency) and outgoing (load) feeder grounding conductors bonded to ground bus.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	Neutral bus/pole isolated from ground.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		
				Initial	Date	
10. Confirm that components of control system including terminal block, wiring, and Ni-Cad batteries are complete.		<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>



ACTION	REQUIRED REACTION	Y (✓)	N (✓)	COMMENTS	R (✓)	C (✓)
Record issues				Issue Log Item:		
				Initial	Date	
11. Perform manual transfer operation with both NORMAL and EMERGENCY sources de-energized. Use detachable manual operator to transfer from NORMAL to EMERGENCY and back.	Switch should transfer smoothly and with full contact travel speed.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	Mechanical interlocking should prevent simultaneous closure of NORMAL and EMERGENCY sources.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		
				Initial	Date	
12. Perform manual bypass operation to each source.	Switch should transfer smoothly and with full contact travel speed.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		
				Initial	Date	
<b>ELECTRICAL INTEGRITY</b>						
13. Measure contact resistance on all poles in both closed positions.	Readings are within 50% of the average value, including the neutral pole.	<input type="checkbox"/>	<input type="checkbox"/>	Record results in Data Table.  Spec Section 16415	<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		
				Initial	Date	



ACTION	REQUIRED REACTION	Y (✓)	N (✓)	COMMENTS	R (✓)	C (✓)
14. Perform an insulation resistance test at 1000VDC on each bus section, phase-to-phase and phase to ground.	Minimum insulation resistance shall be 100 megohms.	<input type="checkbox"/>	<input type="checkbox"/>	<p>Record results in Data Table.</p> <p>Test for one minute in accordance with NETA Table 100.1.</p> <p>Isolate ALL control wiring and electronic devices prior to testing.</p> <p>Test across open contacts for both NORMAL and EMERGENCY sources.</p> <p>Test phase-to-ground with all other phases grounded for both NORMAL and EMERGENCY sources.</p> <p>Spec Section 16415</p> <p>Test Name: Insulation Resistance, Reference Equipment Table</p>	<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		
				Initial	Date	
15. Perform insulation resistance test at 1000 VDC to verify Automatic Transfer Switch is isolated from load when bypassed.	Insulation resistance shall equal or exceed 100 Megohms.	<input type="checkbox"/>	<input type="checkbox"/>	<p>Record results in Data Table.</p> <p>Test for one minute in accordance with NETA Table 100.1.</p> <p>Isolate ALL control wiring and electronic devices prior to testing</p> <p>Test Name: Insulation Resistance, Reference Equipment Table</p>	<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		



ACTION		REQUIRED REACTION		Y (✓)	N (✓)	COMMENTS	R (✓)	C (✓)
						Initial	Date	
16. Verify the operation of four-line LCD display and character keyboard.	All data displays operate.	<input type="checkbox"/>	<input type="checkbox"/>			Record Password:	<input type="checkbox"/>	<input type="checkbox"/>
	All program parameters accessible.	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>
Record issues						Issue Log Item:		
						Initial	Date	
17. Verify "In Phase Monitoring" setting.	In phase monitoring is enabled.	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>
Record issues						Issue Log Item:		
						Initial	Date	
18. Verify all voltage, frequency, and time delay settings.	Use ATS microprocessor control system.	<input type="checkbox"/>	<input type="checkbox"/>			Record values in the "Actual Setpoint" column in the ATS Parameters and Setpoints table	<input type="checkbox"/>	<input type="checkbox"/>
	Device pick-up (PU) and drop-out (DO).	<input type="checkbox"/>	<input type="checkbox"/>			Spec Section 16415	<input type="checkbox"/>	<input type="checkbox"/>
Record issues						Issue Log Item:		
						Initial	Date	
19. Verify all applicable local and remote annunciation by the monitoring system for various operating conditions.	Operating Conditions: NORMAL power available	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>
	EMERGENCY power avail.	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>
	ATS in NORMAL position.	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>
	ATS in EMERGENCY position.	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>
	LED indicating lights are operating.	<input type="checkbox"/>	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>





ACTION		REQUIRED REACTION	Y (✓)	N (✓)	COMMENTS	R (✓)	C (✓)
Record issues					Issue Log Item:		
					Initial	Date	
20. Verify proper phase rotation	Emergency source matches utility source.						
Record issues					Issue Log Item:		
					Initial	Date	
<b>TRANSFER OPERATION TESTS</b>							
21. Disconnect NORMAL power source to transfer switch.	Time delay on engine start equals setpoint.			Record results in Data Table.  Spec Section 16231			
	Start signal sent to engine generator.						
	Transfer time delay equals setpoint.						
	Time delay in neutral equals setpoint.						
	ATS transfers to Emergency source position.						
	Total time to connect to Emergency source is no more than 10-seconds.						
Record issues					Issue Log Item:		
					Initial	Date	
22. Restore Normal power source to Automatic Transfer Switch to verify setpoints.	Re-transfer time delay equals setpoint.			Record results in Data Table.  Spec Section 16231			
	ATS transfers to Normal source position.						
	Time delay in neutral equal setpoint.						
	Engine cool down time delay equals setpoint.						



ACTION	REQUIRED REACTION	Y (✓)	N (✓)	COMMENTS	R (✓)	C (✓)
	Engine shuts off after cool down delay times out.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:	<input type="checkbox"/>	<input type="checkbox"/>
				Initial	Date	
23. Repeat steps #21 and #22, except manually disconnect. EMERGENCY source, to simulate failure of the engine, after restoration of NORMAL power and before the re-transfer delay has expired.	Switch should re-transfer to Normal without delay on engine shutdown.	<input type="checkbox"/>	<input type="checkbox"/>	Spec Section 16231	<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:	<input type="checkbox"/>	<input type="checkbox"/>
				Initial	Date	
24. Verify operation of ATS TEST switch.	Simulates failure of normal source.	<input type="checkbox"/>	<input type="checkbox"/>	Spec Section 16231	<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:	<input type="checkbox"/>	<input type="checkbox"/>
				Initial	Date	
<b>BYPASS AND ISOLATION SWITCH OPERATION</b>						
25. Verify Automatic Transfer Switch manual bypass and isolation switch operation with NORMAL source energized and load on ATS.	ATS mechanism is de-energized and power passes through the bypass/isolation switch path.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:	<input type="checkbox"/>	<input type="checkbox"/>
				Initial	Date	



ACTION	REQUIRED REACTION	Y (✓)	N (✓)	COMMENTS	R (✓)	C (✓)
26. Restore the Automatic Transfer Switch to its automatic mode by manually reversing the bypass and isolation switch operation.	ATS mechanism is energized and the bypass/isolation switch path is de-energized.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:	<input type="checkbox"/>	<input type="checkbox"/>
				Initial	Date	
<b>FINAL INSPECTION</b>						
27. After testing is performed on the ATS, verify tightness of field landed feeder terminations (NORMAL, EMERGENCY, and LOAD feeders).	Feeder cable connections properly torqued and marked.	<input type="checkbox"/>	<input type="checkbox"/>	Record results in Data Table.  Bolted torque should comply with NETA Table 100.12 unless manufacturer specified values are listed on the equipment.  Test Name: Bolt Torque Reference Equip. Table	<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		
				Initial	Date	
28. Prior to energization, inspect interior hardware.	All hardware in place and properly torqued.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
	Compartments clear of tools and hardware.	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>
Record issues				Issue Log Item:		
				Initial	Date	

**Test Equipment Used:**

Test Name	Manufacturer	Model Number	Serial Number	Calibration(Date)

**ATS NAMEPLATE DATA**

Parameter	Data
Equipment ID	
Manufacturer	
Model	
Serial No.	
Catalog No	
Mfg. Date	
Current Rating	
Voltage Rating	
Poles:	
Closing & Withstand Amps	
NEMA Enclosure	

**Contact Resistance**

Contacts	A	B	C	N
Normal				
Emergency				



## Insulation Resistance

Phase to Phase	A – B	B - C	C – A
Normal			
Emergency			
Phase to Ground	A - G	B - G	C – G
Normal			
Emergency			
To Load (ATS in Bypass)	A – LOAD	B – LOAD	C - LOAD
Normal			
Emergency			

## PARAMETERS AND SETPOINTS

### Voltage

Parameter	Actual Setpoint	Specification Setpoint	Range	Factory Default
Normal Over-Voltage Dropout				
Normal Over -Voltage Pickup				
Emergency Over-Voltage Dropout				
Emergency Over -Voltage Pickup				
Normal Under-Voltage Dropout				
Normal Under-Voltage Pickup				
Emergency Under-Voltage Dropout				
Emergency Under-Voltage Pickup				

### Frequency

Parameter	Actual Setpoint	Specification Setpoint	Range	Factory Default
Normal Over-Frequency Dropout				
Normal Over -Frequency Pickup				
Emergency Over-Frequency Dropout				
Emergency Over -Frequency Pickup				
Normal Under-Frequency Dropout				
Normal Under-Frequency Pickup				



Parameter	Actual Setpoint	Specification Setpoint	Range	Factory Default
Emergency Under-Frequency Dropout				
Emergency Under-Frequency Pickup				

### **Time Delay**

Parameter	Actual Setpoint	Specification Setpoint	Range	Factory Default
Neutral Position Time Delay				
Normal Failure Time Delay (Gen Start)				
Emergency Failure Time Delay				
Transfer to Emergency Time Delay				
Return to Normal Time Delay				
Engine Cool Down				

*Note: The "Actual Setpoint" column in the above table should be filled in during step 0*

### **Feeder Termination Torque** (Newton Meters or Foot-Pounds)

TORQUE FEEDERS	A	B	C	N	G
NORMAL					
EMERGENCY					
LOAD					

**Final Sign-Off**

Commissioning Agent	Printed Name	Initials	Date
CONTRACTOR	PRINTED NAME	INITIALS	DATE
General Contractor (GC)			
Mechanical Contractor (MC)			
Electrical Contractor (EC)			
TAB Contractor (TAB)			
Controls Contractor (CC)			
Owner's O&M Personnel			