

CHANGE

**U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION**

**ORDER
JO 6480.22
CHG 1**

Air Traffic Organization Policy

Effective Date:
11/02/2010

Implementation
Date:

03/05/2011

SUBJ: Maintenance of Dual Redundant Power Distribution Systems
(DRPDS) Facilities

1. Purpose. This change transmits revised pages to Order JO 6480.22, Maintenance of Dual Redundant Power Distribution Systems (DRPDS) Facilities. This directive implements Configuration Control Decision (CCD) No. N32350, DRPDS Maintenance Handbook JO6480.22 Page Change to include L3 Static Switches and Certification update.

2. Who This Change Affects. This document requires actions by the Airway Transportation System Specialist (ATSS) at operational facilities with Facility, Service, and Equipment Profile (FSEP) equipment: CPDS.

a. For electronic copies, use the Technical Library website at http://nas.amc.faa.gov/technical_library/index.jsp.

b. The ATSS must keep accurate FSEP records and Logistics Inventory System (LIS) addresses to receive printed copies. Printed copies are mailed to the ATSS at operational facilities with an accurate FSEP record using the LIS mailing address per Order 6000.5D, Facility, Service, and Equipment Profile (FSEP).

c. To update LIS information, visit this link: <http://impart.faa.gov/impart/home.html>.

d. The Periodic Maintenance/Certification Scheduling (PMS) database is maintained by the Office of Primary Responsibility (OPR). The release of this document notifies the field of an update to the Remote Monitoring and Logging System (RMLS) National PMS database. An RMLS template will be available to the field for remote maintenance logging in approximately five working days after release of this document.

3. Risks.

a. In compliance with the latest edition of Orders 1100.161, Air Traffic Safety Oversight and JO 1000.37, Air Traffic Organization Safety Management System (SMS) all NAS changes require an SRM assessment prior to delivery. This applies to all products developed under this order.

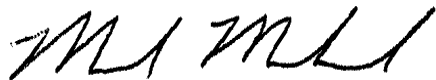
b. The Safety Risk Management Report is available at: http://nas.amc.faa.gov/technical_library/browse?type=mtd&file=6480_22_mthb_chg1_srmrpt.pdf.

4. Disposition of Transmittal. Keep this change.

5. Implementation Date. The implementation date is when all facilities nationwide must comply with these changes. The changes may be implemented anytime after the effective date, but must be implemented by the date located on the front of this document

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for Jay Rupp,
Acting Director, Technical Operations, ATC Facilities

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Standards and Tolerances

Parameter	Reference Paragraph	Standard	Tolerance/Limit	
			Initial	Operating
(18) Output PF low alarm.....		Not Used		
(19) Output THD high alarm.....		Not used		
(20) Output THD low alarm.....		Not used		
(21) Line frequency high alarm.....		61 Hz	Same as standard	Same as standard
(22) Line frequency low alarm.....		59 Hz	Same as standard	Same as standard
(23) Neutral current high alarm.....		225 amps	Same as standard	Same as standard
(24) Total kVA high alarm.....		83 kVA	Same as standard	Same as standard
* 308. L3 Static Transfer Switches (STS) 150-600 AMPS	L3 Technical Manual for Static Transfer Switch 150-600 AMPS		Same as standard	Same as standard
a. Voltage Output (L-N)	530	120 V	±12V	±12V
b. Output Frequency.....	530	60 Hz	±1.2 Hz	±1.2 Hz
c. Switching Time Between Sources..... (In-Phase Transfers ≤ 15° Difference)	Appendix 1	≤4.2 ms	Same as standard	Same as standard
d. Set-point Control.				
(1) Max Phase Error (degrees) for Controlled Transfer.		15	Same as standard	Same as standard
(2) Over-voltage (L-N)		132V	Same as standard	Same as standard
(3) Under-voltage 10 (L-N)		108V	Same as standard	Same as standard
(4) Peak Overload (Amps)			Same as standard	Same as standard
150A unit.....		530		
600A unit.....		2118		
(5) Retransfer Time Delay seconds) ..		15	Same as standard	Same as standard *

Standards and Tolerances

<i>Parameter</i>	<i>Reference Paragraph</i>	<i>Standard</i>	<i>Tolerance/Limit</i>	
			<i>Initial</i>	<i>Operating</i>
* (6) Toggle Retransfer On/Off		Off	Same as standard	Same as standard
(7) Toggle Preferred Source.....		Site Specific (1 or 2)	Same as standard	Same as standard
(8) Delayed Transfer (milliseconds) ..		0	Same as standard	Same as standard *
309. PMCS			Same as standard	Same as standard
a. Software Configuration.....	TI 6480.1 volume 9 section 1.7	Baseline		
(1) Monitor Pro				
(a) Program Version				
<u>1</u> A80, HCF, NCT.....		2.0		
<u>2</u> PCT		2.1	Same as standard	Same as standard
(b) Program Configuration.....		Run-time	Same as standard	Same as standard
(c) Application Revision			Same as standard	Same as standard
<u>1</u> A80.....		12/22/00		
<u>2</u> HCF.....		12/05/00	Same as standard	Same as standard
<u>3</u> NCT.....		1/29/01	Same as standard	Same as standard
<u>4</u> PCT		4/11/02	Same as standard	Same as standard
(2) Concept			Same as standard	Same as standard
(a) Program Version				
<u>1</u> HCF, NCT Main, PSG and EG PLCs..		2.1, B2.1XL	Same as standard	Same as standard
<u>2</u> A80				
<u>a</u> Main PLC.....		2.2, XL SR2		
<u>b</u> PSG and EG PLC		2.1, B2.1XL	Same as standard	Same as standard
<u>3</u> PCT			Same as standard	Same as standard
<u>a</u> Main and PSG PLC		2.2, XL SR2		

Standards and Tolerances

<i>Parameter</i>	<i>Reference Paragraph</i>	<i>Standard</i>	<i>Tolerance/Limit</i>	
			<i>Initial</i>	<i>Operating</i>
<u>b</u> EG PLC.....		2.1, B2.1XL	Same as standard	Same as standard
* <u>c</u> PSG and EG PLC		2.1, B2.1XL		*
(b) Program Configuration.....		Read only	Same as standard	Same as standard
(c) Application Revision			Same as standard	Same as standard
<u>1</u> A80.....		12/22/00	Same as standard	Same as standard
<u>2</u> HCF.....		12/05/00	Same as standard	Same as standard
<u>3</u> NCT		1/29/01	Same as standard	Same as standard
<u>4</u> PCT		4/11/02	Same as standard	Same as standard
(3) SMS				
(a) Program Version.....				
<u>1</u> A80, HCF, NC.....		3.02a	Same as standard	Same as standard
<u>2</u> PCT		3.1	Same as standard	Same as standard
(b) Program Configuration.....				
(c) Application Revision				
<u>1.</u> A80.....		12/22/00	Same as standard	Same as standard
<u>2.</u> HCF.....		12/05/00	Same as standard	Same as standard
<u>3.</u> NCT		1/29/01	Same as standard	Same as standard
<u>4.</u> PCT.....		4/11/02	Same as standard	Same as standard
b. Hardware Configuration.....	TI 6480.1 volume 9	In accordance with TI 6480.1	Same as standard	Same as standard
c. Timing Sequences	TI 6480.1 volume 1	In accordance with TI 6480.1	Same as standard	Same as standard

Standards and Tolerances (Continued)

<i>Parameter</i>	<i>Reference Paragraph</i>	<i>Standard</i>	<i>Tolerance/Limit</i>	
			<i>Initial</i>	<i>Operating</i>
310. Electrical Power Raceways				
a. Cable Insulation (600V or less)				
(1) New Cable.....	JO 6950.22	30 Mohms minimum at 500V dc	Same as standard	Same as standard
(2) Old Cable		10 Mohms minimum at 500V dc	Same as standard	2 Mohms minimum at 500V dc
b. Busway Insulation.....	TI 6480.1 volume 2 1 line Indoor Feeder Busway Instruction Bulletin	1 Mohm per 100 feet of busway	Same as standard	Same as standard
311. – 399. Reserved				

Section 1. Performance Checks

<i>Performance Checks</i>	<i>Reference Paragraph</i>	
	<i>Standards & Tolerances</i>	<i>Maintenance Procedures</i>
402. Every 2 Hours.		
2 Hour Performance Checks While Operating on Stand By Power.	214	503
403. Every 8 Hours.		
a. 8 Hour Performance Checks While Operating on Stand By Power.	214	504
b. 8 Hour Performance Checks While Operating on Commercial Power	208	505
404. Daily.		
* a. Engine Generator.		
Daily fuel filtration.....	302a(4)(a)§	506
b. STS		
Verify proper STS operation is indicated on each STS front control panel.....	308(f-i)	530
405. Weekly (Reserved).		
406. Monthly.		
a. Commercial Transformers Preventive Maintenance¹	301	507
b. UPS Monthly Performance Checks	303f	508
c. Engine Generator Monthly Performance Checks	302a(2)	509
d. Transient Voltage Surge Suppressor (TVSS) Monthly Performance Checks.		510
e. Control and Interrogation Power Systems	304	
(1) DC System Monthly Transfer Switch Operation.....		511
(2) AC System Monthly Transfer Switch Operation		
407. Quarterly.		
a. PMCS Quarterly performance checks	309	512
b. Control and Interrogation Power Systems	304a(1)a	513

¹Maintenance to commercial transformers shall be performed by the local utility company at their discretion.

Section 1. Performance Checks (Continued)

<i>Performance Checks</i>	<i>Reference Paragraph</i>	
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c. UPS Note: When Performance Checks coincide with Preventive Maintenance Checks, perform ONLY the preventive maintenance checks (1) Powerware 9315/BPIII 30-160 Performance Checks..... (2) Powerware 9315/BPIII 180-500 Performance Checks..... (3) VRLA battery resistance measurements.....	303 303 303 303f	TI 6480.1 volume 6 TI 6480.1 volume 6 part 1, book 1 section 7.14 TI 6480.1 volume 6 part 2, book 1 section 7.20 TI 6480.1 volume 6 part 3, book 1 tab 9& volume 8 part 1, book 3 tab 1, 2 and 3
408. Semiannually. a. PMCS. Semi-Annual Utility Outage Test.....	309c 303g 302a,b	514
b. UPS. (1) Perform Preventive Maintenance Procedures.....	303a	TI 6480.1 volume 6 part 2, book 1 tab 1 section 7.20 * TI 6480.1 volume 6 part 1, book 1 tab 1 section 7.14 *

Section 1. Performance Checks (Continued)

<i>Performance Checks</i>	<i>Reference Paragraph</i>	
	<i>Standards & Tolerances</i>	<i>Maintenance Procedures</i>
(2) Perform One-Time Delayed Battery Bank Test (@ > 50% rated UPS load)	303f	TI 6480.1 volume 6 part 2, book 1 sections 5.9 and 7.14.8.9 *
Note: Spot check battery cell (negative) post and cable..... temperatures with infrared gun. Verify that no individual cell or cable temperatures are radically higher than average.		TI 6480.1 volume 6 part 1, book 1 sections 5.3.14 and 7.11.8.9 part 3, book 1 tab 10 *
Record cell # for any DC Tracker low cell shutdown voltage alarm	303g	
409. Annually.		
a. Engine Generators.		
(1) Engine Generator Step Load Test.....	302b(1)	515
(2) EG 2 hour run		
(a) Coolant temperature (outlet).....	302a(2)	
(b) Lubrication oil pressure	302a(6)	
(c) Lubrication oil temperature	302a(6)	
(d) Output frequency	302b(3)	
(e) Output kilowatts.....	302b(1)	
(f) Output voltage.....	302b(4)	
(g) Engine Fuel System Operation.....	302a(4)	
(h) Engine Exhaust for Evidence of Incomplete Fuel	302a(3)	
Combustion		
(i) Radiator Fan Operation.		
(j) Engine Fuel System Main Tank Operation.....	302a(4)	

Section 1. Performance Checks (Continued)

<i>Performance Checks</i>	<i>Reference Paragraph</i>	
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(b) EG Low Oil Pressure Warning and Shutdown Test	302(c)(1)(e)	517
(c) EG Low Fuel level Warning Test.....		518
(d) EG Over-Crank Test.....	302(c)(1)(g)	519
(e) EG Low Coolant Level Shutdown Test		520
(f) EG NOT-IN-AUTO Lamp TEST		521
(g) EG Emergency Stop Test		522
(h) EG Over-Voltage Shutdown Test.....	302(c)(1)(b)	523
(i) EG Under-voltage Shutdown Test	302(c)(1)(c)	524
(j) EG Under-Frequency Shutdown Test	302(c)(1)(d)	525
(k) EG Over-Frequency Shutdown Test		526
(l) EG Low Battery Voltage Test	302(c)(2)(b)	527
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b. Control and Interrogation Power Systems		
(1) Control System Battery and Charger.		
(a) Float and High Rate Voltage Settings Checks	304a	TI 6480.1 volume 8, part 1, book 1, tab 1, section 6.0
(b) Battery State of Charge Verification by Initiating High Rate Charge.	304a	TI 6480.1 volume 8, part 1, book 1, tab 1, section 4.1
(2) Interrogation system ASCO 940 and 7000 transfer switches.		
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(b) Verify transfer set point	304(b)(1 and 2)	529
(3) Control System ASCO 962 and 7000 transfer switches.		
(a) Automatic Transfer Test (UV) For Control and Interrogation Power Systems		
(b) Verify transfer set point	304(a)(3 and 4)	
c. PMCS.		
(1) Perform a manual Hot Standby switchover	309a	TI 6480.1 volume 9
(2) Verify that all PMCS CPU Battery Low Indicators are not active.	309a	TI 6480.1 volume 9
(3) Verify PMCS software configuration	309a	TI 6480.1 volume 9
* d. STS. (see 6000.15E paragraph 321(c). Place STS in maintenance... and perform the following:		
(1) Perform an infrared scan of the STS power connections		531d(1)
(2) Perform transfers		532 or 533
(3) Shut unit down, pull and inspect fuses, and perform A thorough visual inspection of the entire unit.		531d(2)
e. PDUs.		*
(1) Measure/record total harmonic distortion (THD) for each phase voltage, current, and neutral conductor at the each PDU output.	307a	TI 6480.1 volume 7
(2) Measure and record THD at critical bus.	307a	
410. Triennially.		
a. Distribution Equipment Protective and Control Relays	305a(1) and (2)	TI 6480.1 Volume 1
(1) SWGR OV and UV relays	305a(3) and (4)	
(2) SWBD UV and OV	305a(5)	
(3) MCC UV	305a(6)	
(4) CDP UV and sync check relays	305a(3) and (4)	
(5) PSG UV, UF and sync check relays	302c(5)	TI 6480.1 volume 8

Section 1. Performance Checks (Continued)

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(a) Beckwith Engine Generator Protection Relays	302c(4)	TI 6480.1 volume 8
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<u>2</u> 32 device		
<u>3</u> 40 device		
<u>4</u> 59 device		
<u>5</u> 27 device		
<u>6</u> 46 device		
<u>7</u> 87 device		
<u>8</u> 81 device		
<u>9</u> 60FL device		
411. – 435. Reserved.		

Section 2. Other Maintenance Tasks (Continued)

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(5) Arc Chute.....		TI 6480.1 volume 2
(6) Breaker Contacts		
(7) General Inspection		
(8) Lubrication		
* g. MCCs and CDPs.		*
(1) Enclosure		TI 6480.1 volume 5 part 1, book 1 tab 1
(2) Bus Bars and Incoming Line Compartments		
(3) Control Unit		
(4) Tests and maintenance performed with Control Unit removed		
(5) Insulation Tests		
h. MCC and CDP circuit breakers (type NSJ).		
(1) Inspection of terminals		volume 5 tab 4
(2) Cleaning		
(3) Mechanical		
(4) Setting.....		TI 6480.1 volume 1
(5) Perform secondary injection test.....		TI 6480.1 volume 8
i. CDP circuit breakers (type LE).		
(1) Setting.....		TI 6480.1 volume 1

Section 2. Other Maintenance Tasks (Continued)

<i>Maintenance Tasks</i>	<i>Reference Paragraph</i>	
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(3) Molded case inspection		volume 5 part 1, book 1 tab 9
(4) Exercise circuit breaker mechanism		
(5) Circuit breaker cleaning		
(6) Enclosure inspection		
(7) Perform secondary injection test.....		volume 8, part 1, book 3 tab 18
j. SWBDs.		
(1) General Inspection and Cleaning		volume 5 part 1, book 1 tab 23
(2) Bus Bar Joints Lug Terminations and Insulating Materials		
(3) General Lubrication		
k. SWBD circuit breakers (type CK).		
(1) Inspection.....		volume 8 part 1, book 1 tab 31
(2) Cleaning		
(3) Mechanical Checks		
(4) Setting		volume 1 part 2, book 1-4
(5) Perform secondary injection test		
l. SWBD circuit breakers (type ME).		
(1) Setting		TI 6480.1 volume 1 appendix D

Section 2. Other Maintenance Tasks (Continued)

<i>Maintenance Tasks</i>	<i>Reference Paragraph</i>	
	<i>Standards & Tolerances</i>	<i>Maintenance Procedures</i>
(c) Operate DC control system circuit breakers.....		TI 6480.1 volume 8
(2) Inspect AC Interrogation system connections for overheating and tighten as required. Use infrared scanner for detection of loose connections or overheating.		
(a) Inspect and clean transfer switch.....		TI 6480.1 volume 8
(b) Operate transfer switch		
(c) Operate AC control system circuit breakers		
d. Busway and Power Cables.		
Perform insulation megger tests on raceway power cables and busway		
442. Every 3 Years.		
a. Distribution and Lighting Panels		JO 6950.17
Check molded case circuit breakers in all distribution and lighting panels for loose or burned connections and operate each breaker.		
b. Dry Type Transformers		JO 6950.18 TI 6480.1 volume 8
Remove cover and inspect each transformer for signs of overheating or abnormal conditions.		
c. PMCS	chapter 3	TI 6480.1 volume 2
Verify meter calibration and calibrate as necessary.....		TI 6480.1 volume 1
* d. SWGR Circuit Breakers (type DS)		
Perform primary injection to verify DS circuit breaker over-current operation with AVO/Multi-Amp CB Test Set Model DDA-3000/6000 universal circuit breaker test set		TI 6480.1 volume 8 part 1, book 1 tab 17 *
443. Every 5 Years.		
a. Generators and Exciters.		
(1) Measure and record insulation resistance of generators and exciters		TI 6480.1 volume 3
(2) Replace radiator rubber hoses, belts and starting system batteries		
444. – 499. Reserved.		

Chapter 5. Maintenance Procedures

500. Purpose or Function. This chapter establishes the procedures for accomplishing the various essential maintenance activities required for the Dual Redundant Power Distribution System (DRPDS) electrical systems, on either a periodic or incidental basis. The chapter has three sections. The first section describes the procedures for the performance checks listed in chapter 4, section 1 of this handbook. The second section describes the procedures for doing the tasks listed in chapter 4, section 2 of this handbook. The third section describes the procedures for doing special tasks, usually nonscheduled and not listed in chapter 4 of this handbook. Refer to Order 6000.15, General Maintenance Handbook for National Airspace System (NAS) Facilities for additional general guidance.

WARNING: Never work alone while performing maintenance on or troubleshooting DRPDS equipment. High voltage and energy levels are present on much of the DRPDS equipment and extreme caution must always be exercised. Use local lockout/tagout procedures when energizing, startup, or release of energy can occur. This is necessary to make sure that other personnel cannot start the power source during maintenance. Shock hazards can kill. Such procedures are a requirement from the latest version of Order 3900.19, FAA Occupational Safety and Health.

Section 1. Performance Check Procedures

501. General. The Terminal Radar Approach Control Facility (TRACON) DRPDS electrical system has indicators and monitors for measuring system performance. By conducting the performance checks contained in chapter 4, section 1 of this handbook, a determination is made of proper system operation. The performance checks are conducted by observing specific system performance parameters during normal operation or by performing special procedures defined in this section. Whenever the observed parameters are not within the operating tolerances or limits specified, corrective action shall be taken.

502. . FAA Technical Performance Record (TPR) Entries. Order 6000.15 contains policy, guidance and detailed instructions for field use of FAA Technical Performance Record forms. Entries * shall be in accordance with the instructions published in Order 6000.15. TPR forms are available at https://employees.faa.gov/tools_resources/forms/.

503. 2 Hour Performance Checks While Operating on Standby Power. *

a. Object. These procedures establish guidelines for performance checks for the operation of the Power Monitoring and Control System (PMCS), Paralleling Switchgear (PSG), Engine Generators (EGs), and EG Auxiliary equipment of the DRPDS system while on stand by power.

b. Discussion. Prior to conducting any preventive maintenance, ensure that risk assessment and mitigation has been conducted in accordance with paragraph 104 of this handbook, additionally, all work that could impact air traffic should be coordinated with air traffic control (ATC). During operation of the DRPDS system on stand by power, it is critical to perform 2 hour performance checks on the PMCS, PSG, EGs, and EG auxiliary equipment to ensure proper configuration and operation of the system.

c. Conditions. DRPDS system operating on stand by power in accordance with paragraph 214 of this handbook.

d. Detailed Procedures.

(1) Verify proper operation and configuration of the PMCS as described in paragraph 214a of this handbook. For more information on the PMCS, refer to Critical Power Distribution System (CPDS) TI 6480.1, volume 9.

(2) Verify proper operation and configuration of the PSG as described in paragraph 214c of this handbook. For more information on the PSG, refer to TI 6480.1, volume 4.

(3) Verify proper operation and configuration of the EGs as described in paragraph 214d of this handbook. Also verify that the parameters listed in chapter 4, paragraph 409a(2) are within the given tolerances for operating EGs. For more information on the EGs, refer to TI 6480.1 volume 3.

(4) Verify proper operation and configuration of the EG auxiliary equipment as described in paragraph 214e of this handbook. For more information on the EG auxiliary equipment, refer to TI 6480.1 volume 3.

504. 8 Hour Performance Checks While Operating on Standby Power.

a. Object. These procedures establish guidelines for performance checks for the operation of Switchgear (SWGR) 1 & 2, Switchboard (SWBD) 1 & 2, Motor Control Center (MCC), UPS SWGR, the Uninterruptible Power Systems (UPSs), the UPS Output SWBDs, Critical Buses, Power Distribution Units (PDUs), Static Automatic Transfer Switches (SATS), Critical Distribution Panels (CDPs), and the Control and Interrogation Power Systems of the DRPDS system while on stand by power.

b. Discussion. Prior to conducting any preventive maintenance, ensure that risk assessment and mitigation has been conducted in accordance with paragraph 104 of this handbook, additionally, all work that could impact air traffic should be coordinated with ATC. During operation of the DRPDS system on stand by power, it is critical to perform 8 hour performance checks on SWGR 1, SWGR 2, SWBD 1, SWBD 2, the MCCs, the UPS SWGR, the UPSs, the UPS Output SWBDs, the Critical Buses, the PDUs, the SATS, the CDPs and the Control and Interrogation Power Systems in order to ensure proper operation and configuration of the DRPDS system while operating on stand by power.

c. Conditions. DRPDS system operating on stand by power in accordance with paragraph 214 of this handbook.

d. Detailed Procedures.

(1) Verify proper operation and configuration of SWGR 1 and SWGR 2 as described in paragraph 214b of this handbook. For more information on SWGR 1 and SWGR 2, refer to

(4) Open the feeder breaker that is supplying the transfer switch's preferred source. This will cause the transfer switch to sense an under-voltage condition on the preferred source and force the transfer switch to transfer to its secondary source.

(5) Verify that the loads being fed from the transfer switch remain operative.

(6) Close the feeder breaker that was opened in step 529d(4) of this procedure. When the transfer switch times out, it will transfer back to its preferred source.

* **530. Verify Proper SATS Operation from the Front Display Panel.**

a. Object. Check the front control display panel for any indication of static transfer switch (STS) alarms or events.

b. Discussion. The SATS protects the critical loads from power disruptions by automatically switching from a deteriorating preferred power source to a secondary power source within four milliseconds. A status change or alarm indicated on the SATS front display screen may indicate a degradation of power occurred somewhere upstream of the SATS in the DRPDS. A status change or alarm also may indicate an internal error within the SATS unit.

c. Conditions. Unless maintenance is being performed, the SATS shall be in accordance with paragraph 208, DRPDS operation on commercial power.

d. Detailed Procedure. Each SATS should be monitored daily for the presence of alarms and conditions that differ from paragraph 208, DRPDS operation on commercial power. Check the front control panel for any status changes and verify that an alarm condition is not indicated on the display panel. Also, from the Main Menu screen, proceed to the Events Log screen. After a moment, the most recent 512 significant event messages will be displayed on the screen. Check the events screen for any status changes or alarms that have occurred since the last check. An audible alarm should also be heard if an SATS event has occurred. If a status change or alarm has occurred, the cause of the event needs to be determined. Additional troubleshooting or corrective action may be required. See the L3 static switch Technical Manual For Static Transfer Switch 150-600Amps for additional information regarding alarms, control logic fault functions, and data logger events messages.

531. Annual SATS Inspections.

WARNING: Use local lockout/tagout procedures when energizing, startup, or release of energy can occur. This is necessary to make sure that other personnel cannot start the power source during maintenance. Shock hazards can kill. Such procedures are a requirement from the latest version of Order 3900.19, FAA Occupational Safety and Health.

a. Object. Annual inspections for the static automatic transfer switch (SATS) should be performed to prevent any potential developing problems within the SATS unit before they affect National Airspace System (NAS) critical loads.

b. Discussion. Prior to conducting any periodic maintenance, perform risk assessment and

*

* mitigation. Prior to beginning any periodic maintenance procedure, read the procedure in its entirety in order to fully understand the task and the implications of performing said task.

c. Conditions. Annual performance checks and maintenance requires isolating the SATS from critical loads. Isolate the SATS in accordance with the following steps:

(1) Set or verify the DRPDS configuration in accordance with chapter 4 paragraph 403b of this handbook.

(2) Prior to unloading the SATS, verify both SATS in the effected Critical Group are switched to the same source. For example, if unloading SATS1A, perform a manual transfer to Source 2 to match the configuration of SATS1B. This will eliminate the paralleling of UPS2 and UPS3 during the close transition unloading process performed by the PMCS.

(3) Place the affected Critical Group into the Maintenance Mode via the Operator Workstation (OWS). From the Maintenance options, select the appropriate DE-EN SATSX-X.

(4) Verify the effected CDP performed a close transition cross tie operation.

(5) Verify the associated PDU output breakers are open and perform local lockout/tagout procedures.

d. Detailed Procedure. After the STS is isolated from facility loads perform the following:

(1) Infrared Scan. Open the lower panel of the SATS unit. Using an infrared camera or infrared gun, check for hot spots in the power connections. It is important to scan the power connections immediately after the SATS is isolated in order to see an accurate thermal image of the heat generated under ordinary loads. If the temperature rises above 65 C, check the power connection hardware and re-torque as required. For torque values for power connections and further information regarding the static transfer switch, refer to the L3 static switch Technical Manual For Static Transfer Switch 150-160 Amps.

(2) Visual Inspection. Verify the STS is completely de-energized and no voltages are present at SATS power connections. Pull and inspect all control fuses. Perform a thorough visual inspection of the entire unit. Check for discoloration of wire harness, cables, and components. Also, check for dust and debris accumulation within the STS and clean as necessary. If needed, check airflow and ventilation.

532. Annual SATS Performance Checks Using Powerlogic SMS-3000 Software.

a. Object. Annual inspections for the static automatic transfer switch (SATS) should be performed to verify proper operation. Annual performance checks are also needed to prevent potential developing problems within the SATS unit before they affect National Airspace System (NAS) critical loads.

b. Discussion. Prior to conducting any periodic maintenance, perform risk assessment and mitigation. Prior to beginning any periodic maintenance procedure, read the procedure in its entirety in order to fully understand the task and the implications of performing said task. Annual performance checks can be performed using one of two methods to capture the switch times of the SATS. The first method utilizes Powerlogic SMS-3000 software installed on the OWS and information received from the *

- * Circuit Monitor 4000 (CM4000) installed on the SATS. The second method utilizes a Lines Disturbance Analyzer (LDA) placed on the load side of the SATS. Both methods are acceptable and the method used is solely determined by local procedures or technician preference. If the LDA is used, refer to paragraph 533.

c. Conditions. To utilize SMS-3000 software to capture the switching times of the SATS, the following verification and setup must be performed:

(1) At the Operator Workstation (OWS), verify the SMS-3000 Server is running. If not, start the SMS-3000 Server by clicking on the SMS-3000 SERVER button on the OWS Graphics Index GUI screen. Enter the site specific username and password.

Note: The default username and password is master.

(2) Verify the SMS-3000 Client is running. If not, start the SMS-3000 Client by clicking on the SMS-3000 CLIENT button on the OWS Graphics Index Screen. Enter the site specific username and password at the login prompt.

Note: The default username and password is master.

(3) Verify the SMS-3000 Client begins its startup sequence. Once the sequence is done, verify the DRPDS system is online as indicated on the lower right corner of the client window.

(4) To open the DRPDS system, click on FILE in the upper menu selections. From the File drop down menu, click on OPEN SYSTEM. From the System window click on DRPDS and then click OPEN.

(5) To verify the disturbance parameters of the CM4000 installed on the SATS, first click on SETUP in the upper menu selections. From the Setup drop down menu, click on DEVICES/ROUTING.

(6) The Setup Device/Routing window appears. From the Devices Defined list, scroll down and click on the applicable SATS CM-4000 (for example, SATS2A CM4000).

(7) On the right hand side of the Setup Devices/Routing window, click on CONFIGURE.

(8) A Setup Device – SATSXX CM-4000 window appears. Click on the ONBOARD ALARMS/EVENTS tab.

(9) In the Waveshape folder, click on WAVESHAPEVLN. Verify the following selections and setpoints:

- (a) Enable - Selected
- (b) Threshold = 5
- (c) Upper Limit = 15
- (d) Enable Setpoint Learning - NOT selected
- (e) Priority - Priority 1 (High)
- (f) Data Logs - None selected

*

- * (g) Disturbance WFC – Selected
- (h) Adaptive WFC – NOT selected

(10) If no changes were made, click CLOSE to exit. If changes were made to any of the above setpoints or selections, click on the UPDATE button to send the changes to the CM-4000. A warning will appear informing the user the CM-4000 will perform a reset during the update process – Click YES to proceed.

(11) Repeat the steps in paragraphs 532c(5) through 532c(1)0 for the CM4000 installed on each SATS scheduled to be tested.

(12) To unload the SATS being tested, set or verify the DRPDS configuration is in accordance with chapter 4, paragraph 403b of this handbook.

(13) Prior to unloading the SATS, verify both SATS in the affected Critical Group are switched to the same source. For example, if unloading SATS1A, perform a manual transfer to Source 2 to match the configuration of SATS1B. This will eliminate the paralleling of UPS2 and UPS3 during the close transition unloading process performed by the PMCS.

(14) Place the affected Critical Group into the Maintenance Mode via the Operator Workstation (OWS). From the Maintenance options, select the appropriate UNLOAD SATSX-X.

(15) Verify the affected CDP performed a close transition cross tie operation and the SATS being tested is unloaded.

d. Detailed Procedure. Perform the following procedure to verify the switching time of the SATS.

(1) Verify the Phase Status indicator is green indicating Sources 1 and 2 are in phase. If the Phase Status indicator is red, determine and correct the cause of the out-of-phase condition before proceeding.

(2) Verify the SATS being tested is operating in Static Mode on Source 1 and Auto Retransfer is disabled.

(3) At the SATS CM4000, acknowledge the Priority 1 Alarm Log by first selecting the Alarm Menu from the CM4000 Main Menu. Select Priority 1 Alarms from the Alarm Menu. View the stored alarms and then press the Menu button to exit. A prompt appears asking the user to acknowledge the alarms, press the DOWN ARROW to change the “No” to “Yes” and then press the ENTER button. Return to the Main Menu.

(4) At the SATS, perform a manual static transfer from Source 1 to Source 2. Verify the CM4000 briefly goes into alarm as indicated by the display and flashing red LED.

(5) At the OWS, retrieve the waveform capture by first clicking on DISPLAY in the upper menu selection of SMS-3000.

(6) From the display drop down menu, click on WAVEFORM PLOTS. The Select Waveform. *

- * (7) Source window appears. Expand the All Devices folder and locate the applicable SATS CM4000 and click on it, then click OK.
- (8) The Acquire Waveform window appears. Expand the Onboard folder and then expand the Disturbance Waveform folder. Locate the file with the corresponding date/time as the manual transfer performed in paragraph 532d(4). Click on it and then click OK to upload the file. If a corresponding file does not exist, verify the time and date is correctly set on the CM4000. If the time and date are correctly set, re-verify the disturbance parameters.
- (9) Once the upload is complete, a 12-Cycle Waveform appears. Click on the 3 icon on the waveform toolbar to display all three phases simultaneously. To display only the voltage waveform, double click on the Voltage label above the graph. Locate the disturbance in the waveform using the zoom function (magnifying glass icons). Once the disturbance is found, verify the switch time is within the tolerance provided in chapter 3, paragraph 308(c) of this order.
- (10) To save a copy of the waveform for future reference, click on the *E* icon on the waveform toolbar. An Export Waveform Format window appears. Select OTHER (Selected Graph) and then click OK. An Exporting Voltage window appears. Select JPG under Export. Select FILE under Export Destination and then click BROWSE. The Save As window appears. Choose the desired location (for example, My Documents) and create an applicable file name (for example, SATS1A_ManSW_S1toS2) and then click SAVE. Click EXPORT on the Exporting Voltage window to save the waveform to the desired location. Close the waveform and return to the SATS.
- (11) At the SATS, perform a manual static transfer from Source 2 to Source 1.
- (12) Repeat steps in paragraphs 532d(5) through 532d(10) to verify the switch time.
- (13) Perform a manual transfer from Source 1 static to Source 1 bypass. Verify a make before break or close transition occurred by the absence of a Waveform Capture in SMS-3000.
- (14) Perform a manual transfer from Source 1 bypass to Source 1 static. Verify a make before break or close transition occurred by the absence of a Waveform Capture in SMS-3000.
- (15) With the SATS on Source 1 static mode, open the PDU breaker which feeds Source 1 of the SATS. Verify a transfer to Source 2 static occurred and repeat steps in paragraphs 532d(5) through 532d(10) to verify the switch time.
- (16) Close the PDU output breaker to restore Source 1 to the SATS.
- (17) With the SATS on Source 2 static mode, perform a manual transfer from Source 2 static to Source 2 bypass. Verify a make before break or close transition occurred by the absence of a Waveform Capture in SMS-3000.
- (18) Perform a manual transfer from Source 2 bypass to Source 2 static. Verify a make before break or close transition occurred by the absence of a Waveform Capture in SMS-3000.
- (19) With the SATS on Source 2 static mode, open the PDU breaker which feeds Source 2 of the SATS. Verify a transfer to Source 1 static occurred and repeat steps 532d(5) through 532d(10) to verify the switch time. *

* (20) To place the SATS back into service, verify the SATS is switched to the same source as the SATS currently supporting the critical load to prevent paralleling of UPS2 and UPS3 during the PMCS reloading process.

(21) At the OWS, on the applicable Critical Group GUI screen, click RELOAD SATSXX. Verify the PMCS reloads the affected SATS and return the Critical Group control back to Auto.

(22) Reconfigure the SATS back to normal configuration (for example, SATXA to Source 1 static mode and SATSXB to Source 2 static mode.)

533. Annual SATS Performance Checks using a Line Disturbance Analyzer (LDA).

a. Object. Annual inspections for the static automatic transfer switch (SATS) should be performed to verify proper operation. Annual performance checks are also needed to catch any potential developing problems within the SATS unit before the problems can affect National Airspace System (NAS) critical loads.

b. Discussion. Prior to conducting any periodic maintenance, perform risk assessment and mitigation. Prior to beginning any periodic maintenance procedure, read the procedure in its entirety in order to fully understand the task and implications of performing said task. Annual SATS performance checks can be performed using one of two methods to capture the switch times of the SATS. The first method utilizes Powerlogic SMS-3000 software installed on the OWS and information received from the Circuit Monitor 4000 (CM4000) installed on the SATS. The second method utilizes a Lines Disturbance Analyzer (LDA) placed on the load side of the SATS. Both methods are acceptable and the method used is solely determined by local procedures or technician preference. If the SMS-3000 software is used, refer to paragraph 532.

WARNING: Use local lockout/tagout procedures when energizing, startup, or release of energy can occur. This is necessary to make sure that other personnel cannot start the power source during maintenance. Shock hazards can kill. Such procedures are a requirement from the latest version of Order 3900.19, FAA Occupational Safety and Health.

c. Conditions. To utilize an LDA (for example, Dranetz) to capture the switching times of the SATS, the following setup must be performed:

(1) If connecting the LDA on the *A* side, perform a manual static transfer of the *A* side SATS to Source 2 in the affected Critical Group. If connecting the LDA on the *B* side, perform a manual transfer of the *B* side SATS to Source 1 in the affected Critical Group.

(2) Using the Maintenance Mode, select and de-energize the desired SATS from the PMCS OWS.

(3) Connect the voltage leads of the LDA (Dranetz 4300 or equivalent) to individually monitor the SATS output phase voltages (line to neutral) at the CDP.

Note: Connect the leads to the line side of CDPX-M1 or CDPX-M2.

*

- * (4) Set the LDA to capture voltage disturbances on all phases as follows:

DRANETZ settings:

Input configuration = 4 WIRE / 3 PROBE
 RMS LIMIT ON_ALL
 V LOW RMS LIMIT ON_ALL
 V TRANSIENT MAGNITUDE ON_ALL
 V FREQ HZ SENSITIVITY ON_ALL

PARAMETER STATUS:

	A	B	C
V HIGH RMS LIMIT	ON	ON	ON
V LOW RMS LIMIT	ON	ON	ON
V TRANSIENT MAGNITUDE	ON	ON	ON
V FREQ HZ SENSITIVITY	ON	ON	ON

- (5) Re-energize the SATS de-energized in paragraph 533c(2). Do not reload the SATS at this time. Ensure the LDA monitoring is turned on (write down the number of events).

d. Detailed Procedure. Perform the following procedure to verify the switching time of the SATS.

- (1) Verify the Phase Status indicator is green indicating Source 1 and 2 are in phase. If the Phase Status indicator is red, determine and correct the cause of the out of phase condition before proceeding.
- (2) Verify the SATS being tested is operating in Static Mode on Source 1 and Auto Retransfer is disabled.
- (3) Perform a manual static transfer from Source 1 to Source 2. Verify the SATS transfers to the selected source.
- (4) Using the information provided by the LDA, verify the transfer time is within tolerance in chapter 3 paragraph 308c. Label and retain waveform data (hard or soft copy).
- (5) Perform a manual static transfer from Source 2 to Source 1. Verify the SATS transfers to the selected source.
- (6) Using the information provided by the LDA, verify the transfer time is within tolerance in chapter 3 paragraph 308c. Label and retain waveform data (hard or soft copy).
- (7) Perform a manual transfer from Source 1 static to Source 1 bypass. Verify a make before break or close transition occurred by the absence of a disturbance event on the LDA.
- (8) Perform a manual transfer from Source 1 bypass to Source 1 static. Verify a make before break or close transition occurred by the absence of a disturbance event on the LDA.
- (9) With the SATS on Source 1 static mode, open the PDU breaker which feeds Source 1 of the SATS. Verify a transfer to Source 2 static occurred.

*

- * (10) Using the information provided by the LDA, verify the transfer time is within tolerance in chapter 3 paragraph 308c. Label and retain waveform data (hard or soft copy).
- (11) Close the PDU output breaker to restore Source 1 to the SATS.
- (12) With the SATS on Source 2 static mode, perform a manual transfer from Source 2 static to Source 2 bypass. Verify a make before break or close transition occurred by the absence of a disturbance event on the LDA.
- (13) Perform a manual transfer from Source 2 bypass to Source 2 static. Verify a make before break or close transition occurred by the absence of a disturbance event on the LDA.
- (14) With the SATS on Source 2 static mode, open the PDU breaker which feeds Source 2 of the SATS. Verify a transfer to Source 1 static occurred.
- (15) Using the information provided by the LDA, verify the transfer time is within tolerance in chapter 3 paragraph 308c. Label and retain waveform data (hard or soft copy).
- (16) To disconnect the LDA, de-energize the SATS using the OWS Maintenance Mode functions. Remove the LDA test leads from the CDP main breaker.
- (17) Re-energize, but do not reload the SATS using the OWS Maintenance Mode.
- (18) Prior to reloading the SATS, verify the SATS is switched to the same source as the SATS currently supporting the critical load to prevent paralleling of UPS2 and UPS3 during the PMCS reloading process.
- (19) At the OWS, reload the SATS using the Maintenance Mode functions. Verify the PMCS reloads the affected SATS and return the Critical Group control back to Auto.
- (20) Reconfigure the SATS back to normal configuration (for example, SATXA to Source 1 static mode and SATSXB to Source 2 static mode).

534-550. Reserved.

*

Section 2. Other Maintenance Tasks Procedures

551-575. Reserved.

Section 3. Special Maintenance Procedures

576-599. Reserved.

Appendix 1. Certification Requirements

* A-1. System and Subsystem Certification.

System and subsystem certification is event based and relies on independent judgment about the quality and scope of specific advertised services being provided to a user. Event based certification ties the certification judgment to the decision to place a system or subsystem into service.

a. ATO personnel with certification authority must perform event based system and subsystem certification. The following events define when certification is required, regardless of whether it affects a certification parameter:

- (1) Prior to commissioning.
- (2) Upon request following aircraft accident/incidents.
- (3) Following adjustment to any certification parameter regardless of whether an interruption was required.
- (4) Prior to restoration following any flight inspection requiring on-site personnel.
- (5) Prior to restoration following any modification.
- (6) Prior to restoration following any maintenance task that required an interruption or would have required an interruption to a facility without redundancy.
- (7) Prior to restoration following any corrective maintenance activity required to restore a facility to operation.

b. System and subsystem certification is not required when a facility is restored to operation by restoration of power, initialization, or reset, and no other action was taken.

c. Some NAS systems contain user interface controls that can cause a certification parameter to be adjusted beyond its tolerance or limit. Such adjustments will not void the certification.

A-2. General.

a. This appendix defines the requirements for certification of the TRACON facility's DRPDS electrical equipment. Certification shall be performed on an event basis. Certification should be coordinated with local facility air traffic management and accomplished in conjunction with risk assessment and risk mitigation. The requirement for certification is defined in Order 6000.15. The DRPDS operation and configuration shall be verified in accordance with chapter 4 paragraph 403b of this handbook just prior to performing certification. Reference TI 6480.1, volumes 7 and 9 for SATS and PMCS operating instructions. Reference Commercial off the Shelf (COTS) Manual volume 6 for UPS operating instructions. *

* **b.** The DRPDS operator must review the entire certification procedure prior to initiating any portion of it. If a DRPDS service fails to meet a certification parameter requirement as identified in Table A-1, DRPDS Power System, of this appendix, the certification shall be secured and the DRPDS shall be restored to a reduced service configuration and verified by a DRPDS system specialist or DRPDS second level engineering support. The DRPDS certification shall continue after any failures are corrected and until all certification parameters are within requirements.

c. The DRPDS certification focuses on two provided services. First, the certification evaluates UPS, engine generators, and STS equipment operation in order to provide continuous power to the critical load. The second part evaluates the UPS's capability to provide conditioned power to the critical load. Both services shall be provided concurrently to the critical load.

d. Certification can be performed piecewise as required to meet power system availability requirements imposed by facility management. Although EG operation is required to support continuous power certification, UPS and SATS certification can be performed on utility. Critical Distribution Panelboards (CDPs) that are not immediately supporting SATS or UPS certification can be returned to a normal line-up to maximize load diversification.

Note: Certification should be coordinated and accomplished in conjunction with risk assessment and risk mitigation.

A-3. Certification Procedure.

*

a. Unload SATS on "A" side in accordance with the following steps.

(1) Set or verify the DRPDS configuration in accordance with chapter 4 paragraph 403b of this handbook.

(2) Configure SATS 1 through 4 (A and B) to static source 2.

* **Note:** Step A-2a(2) configures the SATS to allow each CDP side to receive power from the same UPS source (for example, UPS 3). During unload SATS operations that are initiated at the PMCS OWS, the PMCS will prevent disturbing power to downstream loads by automatically hot cross tying (close transition) the downstream CDP prior to unloading the selected SATS. Configuring the SATS as described in step A-2a(2) minimizes the potential for losing both the A side and the B side UPS should a transient occur while the CDP is in a hot crosstie configuration on UPS power.

*

*

(3) Individually unload SATS 1A, 2A, 3A and 4A from the PMCS OWS (rotate critical loads to DRPDS B side SATS while isolating the A side SATS).

(4) Verify that SATS 1B, 2B, 3B and 4B are operating properly on source 2 with source 1 and 2 available.

(5) Configure SATS 1A, 2A, 3A and 4A back to static source 1.

* **b.** Connect a Line Disturbance Analyzer (LDA) to SATS 1A as directed by the setup procedures provided in paragraph A-3 or configure the Powerlogic Circuit Monitor (CM4000) associated with SATS 1A as directed by the setup procedures provided in paragraph A-4. Both methods are acceptable and the method used is solely determined by local procedures or technician preference.

c. Transfer DRPDS loads to the PSG in accordance with chapter 4 paragraph 408a(1).

(1) Verify that all engines start and that the PMCS automatically connects SWGR 1 and SWGR 2 to generator power.

(2) Verify that sufficient engine capacity powers the DRPDS.

(3) Verify that all UPSs go to BATTERY when 1M1 and 2M1 open.

(4) Record UPS load, battery % capacity or minutes displayed on the UPS GUI.

(5) Verify that battery capacity is sufficient (reference chapter 3, paragraph 303f(8)).

(6) Verify that all UPSs go back to NORMAL mode after the transfer to EG power is complete.

(7) Verify that there are no disturbances recorded on the LDA or CM4000.

(8) Label and retain data (hard or soft copy) in the facility reference data (FRD).

d. Verify that UPS 2 is operating in NORMAL mode at rated voltage and frequency (reference chapter 3, paragraphs 303a(9), 303a(10), 303a(15) and 303c(4)) with no active alarms.

e. Manually transfer UPS 2 to BYPASS.

(1) Verify that a make before break or closed transition is recorded on the LDA or CM4000 (reference chapter 3, paragraph 303e(2)).

(2) Label and retain waveform data (hard or soft copy) in the FRD.

f. Manually transfer UPS 2 to NORMAL.

(1) Verify that a make before break or closed transition is recorded on the LDA or CM4000 (reference chapter 3, paragraph 303e(2)).

*

- * (2) Label and retain waveform data (hard or soft copy) in the FRD.
- g.** Perform a protective transfer of UPS 2 to BYPASS by performing the following:
 - (1) Isolate UPS 2's battery by opening UPS2's battery contactor or disconnect switches.
 - (2) Open input breaker CB1 at UPS 2.
- h.** Verify that UPS 2 transfers to bypass.
 - (1) Verify that the transfer time captured on the LDA or CM4000 is within the tolerance listed in chapter 3, paragraph 303e(1).
 - (2) Label and retain waveform data (hard or soft copy) in the FRD.
 - (3) Close UPS 2's input breaker CB1.
 - (4) Close UPS 2's battery contactor or disconnect switches.
- i.** Evaluate the UPS performance.
 - (1) Review UPS History Log and verify that no failures occurred during operations.
 - (2) If the UPS does not operate properly in steps A-2e through A-2k(1), UPS repairs should be made before continuing the system certification procedure.
- j.** With UPS 2 in Bypass mode, perform steps A-2.d through A-2.i substituting UPS 1 for UPS 2.
- k.** Return UPS 1 and 2 to Normal mode.
- l.** Configure the SATS selected in A-2b for STATIC mode and AUTOMATIC operation with auto retransfer disabled.
- m.** Manually transfer the selected SATS from sources 1 to source 2 in STATIC mode.
 - (1) Verify that the SATS transfers to the selected source and that the transfer time is within the tolerance listed in chapter 3, paragraph 308.
 - (2) Label and retain waveform data (hard or soft copy) in the FRD.
- n.** Manually transfer the selected SATS from source 2 to source 1 in STATIC mode.
 - (1) Verify that the SATS transfers to the selected source and the transfer time is within the tolerance listed in chapter 3, paragraph 308. *

- * (2) Label and retain waveform data (hard or soft copy) in the FRD.
- o.** Manually transfer the selected SATS from source 1 static to source 1 bypass.
 - (1) Verify the transfer time is within the tolerance listed in chapter 3, paragraph 308b(2).
 - (2) Label and retain waveform data (hard or soft copy) in the FRD.
- p.** Manually transfer the selected SATS from source 1 bypass to source 1 static.
 - (1) Verify the transfer time is within the tolerance listed in chapter 3, paragraph 308b(2).
 - (2) Label and retain waveform data (hard or soft copy) in the FRD.
- q.** With the selected SATS on source 1 in static mode, open the PDU output breaker that feeds source 1 of the selected SATS.
 - (1) Verify that the SATS transfers to the available source, and that the transfer time is within the tolerance listed in chapter 3, paragraph 308b(1).
 - (2) Label and retain waveform data (hard or soft copy) in the FRD.
- r.** Close the PDU output breaker that feeds source 1 of the selected SATS. Verify sources 1 and 2 are available and the SATS remains on source 2.
- s.** With the selected SATS on source 2 in static mode, open the PDU output breaker that feeds source 2 of the selected SATS.
 - (1) Verify that the SATS transfers to the available source and that the transfer time is within the tolerance listed in chapter 3, paragraph 308b(1).
 - (2) Label and retain waveform data (hard or soft copy) in the FRD.
- t.** Close the PDU output breaker that feeds source 2 of the selected SATS. Verify sources 1 and 2 are available and the SATS remains on source 1. Label and retain waveform data (hard or soft copy) in the FRD.
- u.** Evaluate the selected SATS performance. If the SATS under test does not operate properly in steps A-2o through A-2ae, repairs should be made before continuing the system certification procedure.
- v.** If using an LDA at the PMCS OWS, de-energize the SATS evaluated in step A-2u.
 - (1) Disconnect the LDA connected in step A-2b.
 - (2) Re-energize the selected SATS from the PMCS OWS.

*

- * w. Perform step A-2b for SATS 2A.
- x. Perform steps A-2l through A-2v for SATS 2A.
- v. Perform step A-2b for SATS 3A.
- z. Perform steps A-2l through A-2v for SATS 3A.
- aa. Perform step A-2b for SATS 4A.
- ab. Perform steps A-2l through A-2v for SATS 4A.
- ac. Reload “A” side SATS in accordance with the following three steps.
 - (1) Verify or carefully set each SATS (1 through 4 A and B) to source 2 static.

Note: Paragraph A-2ac(1) configures the SATS to allow each CDP side to receive power from the same UPS source for example, UPS 3). During unload SATS operations that are initiated at the PMCS OWS, the PMCS will prevent disturbing power to downstream loads by automatically hot cross tying (close transition) the downstream CDP prior to unloading the selected SATS. Configuring the SATS as described in step A-2ao(1) minimizes the potential for losing both the A side and the B side UPS should a transient occur while the CDP is in a hot crosstie configuration on UPS power.
 - (2) Individually re-load SATS 1A, 2A, 3A and 4A from the PMCS OWS.
 - (3) Verify that the DRPDS is stable with acceptable power from UPS 2 and UPS 3 at each SATS.
- ad. After the DRPDS is stable, individually unload B side SATS by performing the following:
 - (1) Verify or carefully set each SATS (1 through 4, A and B) to source 2 static.
 - (2) Carefully unload SATS 1B, 2B, 3B and 4B from the PMCS OWS (switch all critical loads to side A while isolating side B).
 - (3) Verify that SATS 1B, 2B, 3B and 4B are operating properly on source 2 with sources 1 and 2 available.
 - (4) Verify that SATS 1A, 2A, 3A and 4A are operating properly on source 2 with sources 1 and 2 available.
 - (5) Carefully set each A side SATS (1A, 2A, 3A and 4A) to source 1.

*

- * **ae.** Perform step A-2b for SATS 1B.
- af.** Perform steps A-2d through A-2i for UPS 3.
- ag.** Return UPS 3 to NORMAL mode.
- ah.** Perform steps A-2l through A-2v for SATS 1B.
- ai.** Perform step A-2b for SATS 2B.
- aj.** Perform steps A-2l through A-2v for SATS 2B.
- ak.** Perform step A-2b for SATS 3B.
- al.** Perform steps A-2l through A-2v for SATS 3B.
- am.** Perform step A-2b for SATS 4B.
- an.** Perform steps A-2l through A-2u. (For example, leave the LDA connected to SATS 4B).
- ao.** Return DRPDS loads to utility in accordance with (IAW) chapter 4, paragraph 408a.
 - (1) Verify that the DRPDS is operating IAW chapter 4, paragraph 403b.
 - (2) Verify that there are no disturbances recorded on the LDA or CM4000.
- ap.** If LDA is used, perform step A-2v for SATS 4B.
- aq.** Re-load SATS 1B, 2B, 3B and 4B in accordance with the following steps.
 - (1) Carefully set each SATS (1 through 4 A and B) to static source 1.

Note: Step A-2ad(2) configures the SATS to allow each CDP side to receive power from the same UPS source (for example, UPS 3). During unload SATS operations that are initiated at the PMCS OWS, the PMCS will prevent disturbing power to downstream loads by automatically hot cross tying (close transition) the downstream CDP prior to unloading the selected SATS. Configuring the SATS as described in step A-2ad minimizes the potential for losing both the A side and the B side UPS should a transient occur while the CDP is in a hot crosstie configuration on UPS power.

- (2) Individually re-load SATS 1B, 2B, 3B and 4B from the PMCS OWS.

*

- * (3) Carefully set each of the B side SATS to source 2.
- (4) Verify that the DRPDS is stable with acceptable power from UPS 2 and UPS 3 at each SATS.
 - ar. Record the certification results.
 - as. Repair equipment that does not pass certification parameter requirements. After repairing equipment, re-perform failed certification steps.

A-4. Line Disturbance Analyzer (LDA) Setup Procedure.

- a. Select and de-energize SATS 1A from the PMCS OWS.

WARNING: Use local lockout/tagout procedures when energizing, startup, or release of energy can occur. This is necessary to make sure that other personnel cannot start the power source during maintenance. Shock hazards can kill. Such procedures are a requirement from the latest version of Order 3900.19, FAA Occupational Safety and Health.

- b. Connect an LDA and a voltmeter as follows to the SATS de-energized in step A-3a. *

- (1) Connect the LDA (Dranetz 4300 or equivalent) voltage leads to individually monitor the SATS output phase voltages (line to neutral) at the CDP.

Note: Connect at the line side of the main breaker.



Figure A-1. Dranetz Connection

(2) Set the LDA to capture voltage disturbances on all phases as follows:

DRANETZ settings:

Input configuration = 4 WIRE / 3 PROBE

THRESHOLD SETUP :

	A	B	C
V HIGH RMS LIMIT	122.0	122.0	122.000
V LOW RMS LIMIT	116.0	116.0	116.000
V TRANSIENT MAGNITUDE	50.0	50.0	50.000
V FREQ HZ SENSITIVITY	0.5	0.5	0.5

WAVE CAPTURE STATUS:

V HIGH RMS LIMIT ON_ALL

V LOW RMS LIMIT ON_ALL

V TRANSIENT MAGNITUDE ON_ALL

V FREQ HZ SENSITIVITY ON_ALL

PARAMETER STATUS:

	A	B	C
V HIGH RMS LIMIT	ON	ON	ON
V LOW RMS LIMIT	ON	ON	ON
V TRANSIENT MAGNITUDE	ON	ON	ON
V FREQ HZ SENSITIVITY	ON	ON	ON

- * c. Re-energize the SATS de-energized in step A-3a. Ensure that the LDA monitoring is turned on (remember the number of events).

A-5. Powerlogic Circuit Monitor (CM4000) Setup Procedure.

a. At the Operator Workstation (OWS), perform the following.

(1) Start the SMS-3000 Server by clicking on the SMS-3000 SERVER button on the OWS Graphics Index GUI screen. Enter the site specific username and password.

Note: The default username and password is *master*.

(2) Start the SMS-3000 Client by clicking on the SMS-3000 CLIENT button on the OWS Graphics Index Screen. Enter the site specific username and password at the login prompt.

Note: The default username and password is *master*.

(3) Verify the SMS-3000 Client begins its startup sequence. Once the sequence is done, verify the DRPDS system is online as indicated on the lower right corner of the client window.

(4) To open the DRPDS system, click on FILE in the upper menu selections. From the File drop down menu, click on OPEN SYSTEM. From the System window click on DRPDS and then click OPEN.

(5) To verify the disturbance parameters of the CM4000 installed on the SATS, first click on SETUP in the upper menu selections. From the Setup drop down menu, click on DEVICES/ROUTING.

(6) The Setup Device/Routing window appears. From the Devices Defined list, scroll down and click on the applicable SATS CM-4000 (for example, SATS2A CM4000).

(7) On the right hand side of the Setup Devices/Routing window, click on CONFIGURE.

(8) A Setup Device – SATSXX CM-4000 window appears. Click on the Onboard ALARMS/ EVENTS tab.

(9) In the Waveshape folder, click on WAVESHAPEVLN. Verify the following selections and setpoints.

- (a) Enable - Selected
- (b) Threshold = 5
- (c) Upper Limit = 15
- (d) Enable Setpoint Learning - NOT selected
- (e) Priority - Priority 1 (High)
- (f) Data Logs - None selected

*

- * (g) Disturbance WFC – Selected
- (h) Adaptive WFC – NOT selected

(10) If no changes were made, click CLOSE to exit. If changes were made to any of the above setpoints or selections, click on the UPDATE button to send the changes to the CM-4000. A warning will appear informing the user the CM-4000 will perform a reset during the update process – Click YES to proceed.

(11) Repeat steps A-4a(5) through A-4a(10) for the CM4000 installed on each SATS scheduled to be tested.

(12) To retrieve a waveform, at the OWS, click on DISPLAY in the upper menu selection of SMS-3000.

(13) From the display drop down menu, click on WAVEFORM PLOTS. The Select Waveform Source window appears. Expand the All Devices folder and locate the applicable SATS CM4000 and click on it. Then click OK.

(14) The Acquire Waveform window appears. Expand the Onboard folder and then expand the Disturbance Waveform folder. Locate the file with the corresponding date/time as the manual transfer performed in step A-4a(4) and click on it. Then click OK to upload the file. If a corresponding file does not exist, verify the time and date is correctly set on the CM4000. If the time and date are correctly set, re-verify the disturbance parameters.

(15) Once the upload is complete, a 12-Cycle Waveform appears. Click on the “3” icon on the waveform toolbar to display all three phases simultaneously. To display only the voltage waveform, double click on the Voltage label above the graph. Locate the disturbance in the waveform using the zoom function (magnifying glass icons). Once the disturbance is found, verify the switch time is within the tolerance provided in Chapter 3 of this order.

(16) To save a copy of the waveform for future reference, click on the “E” icon on the waveform toolbar. An Export Waveform Format window appears. Select OTHER (SELECTED GRAPH) and then click OK. An Exporting Voltage window appears. Select JPG under Export. Select FILE under Export Destination and then click BROWSE. The Save As window appears. Choose the desired location (for example, My Documents) and create an applicable file name (for example, SATS1A_ManSW_S1toS2) and then click SAVE. Click EXPORT on the Exporting Voltage window to save the waveform to the desired location. Close the waveform and return to the SATS.

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Appendix 1. Certification Requirements

Table A-1. DRPDS Power System

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Advertised Service	Certification Parameters	Reference Paragraph
b. Continuous Power	(1) UPS Operation	
	a. Manual transfer normal to bypass	303e(2)
	b. Manual transfer bypass to normal	303e(2)
	c. Protective transfer to bypass	303e(1)
	d. Battery bank capacity	303f(8)
	(2) PMCS response to simulated Outage	
	a. EG capacity during PSG operation	Maintain 2 engines operating (minimum)
	b. Transfer DRPDS to PSG	408a
	c. Critical Bus	No disturbance recorded on LDA or CM4000
	d. Transfer DRPDS to utility	408a
	e. Critical Bus	No disturbance recorded on LDA or CM4000
	(3) Transfer of SATS	
	a. Manual static transfer (in phase)	308c
b. Protective static transfer (in phase)	308bc	
c. Static to bypass transfer	308c	
c. Conditioned Power	(1) UPS Output Voltage	303d(1)
	(2) UPS Output Frequency	303d(4)

Certification Based on Events: Events are defined in Order 6000.15 and are provided only as reference data of appendix 1, paragraph 1 of this order.

*

Person Responsible for Certification: Airway transportation system specialist (ATSS) with certification authority

Certification Entry in Facility Maintenance Log: CPDS/DRPDS certified

