FLORIDA POWER & LIGHT COMPANY
ST. LUCIE UNIT 2
MAINTENANCE PROCEDURE NO. 2-2200062
REVISION 4

2

1.0 TITLE:

2A EMERGENCY DIESEL ELECTRICAL INSPECTION

2.0 REVIEW AND APPROVAL:

Reviewed by Facility Review Group April 25, 1983

Approved by J. H. Barrow (for) Plant Manager June 20, 1983

Revision 4 Reviewed by F R G 3-20 1986

Approved by J H Barrow for Plant Manager 3-20 1986

3.0 PURPOSE:

This procedure provides instructions for the Electrical Inspection and on going equipment qualification of the 2A Emergency Diesel.

4.0 PRECAUTIONS AND LIMITS:

4.1 As per the Technical Specifications, the sequence of switching and valving is at the discretion of the NPS/ANPS.

4.2 Use safety precautions when meggering generator.

4.3 This procedure is to be conducted concurrently with Operating Procedure 2-0400050, "Periodic Integrated Test of Engineered Safety Features." /R4

5.0 RELATED SYSTEM STATUS:

As per the Technical Specifications.

S 2 OPS
DATE
DOCT PROCEDURE
DOCN 2:2200062
SYS
COMP COMPLETED
ITM 4

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6.0 REFERENCES:

6.1 Unit II Technical Specifications 3.3.3.5, 3.8.1.1, 3.8.1.2, 3.8.2.2, Unit II Surveillance requirements 4.8.1.1.1, 4.8.1.2, 4.8.2.2, 4.3.3.5.1, 4.3.3.5.2.

6.2 Administrative Procedure No. 0010432, "Plant Work Orders".

6.3 Operating Procedure No. 0010122, "In-Plant Equipment Clearance Orders".

6.4 Administrative Procedure No. 0010430, "Maintenance on Class I Systems".

6.5 QI 13-PR/PSL-2, "Cleanliness Control Methods".

6.6 Power Systems Diesel Manual - 2998-7435, Chapter 17, Sections 5.1 through 5.6, 5.7.2, and 10.

6.7 FPL Safety Rule Manual.

6.8 Maintenance Procedure No. 0920062, "Grounding or Testing of High Voltage (4.16 or 6.9 KV) Motors".

6.9 Doble Insulation Test, Form 3946.

6.10 QI 11-PR/PSL-3.

6.11 Nuclear Environmental Qualification Program for Diesel Generator Units, Section 5. /R4

7.0 RECORDS REQUIRED:

7.1 A signed off copy of Section 9.0 of this procedure attached with PWO shall be retained as QA records in accordance with QI 17-PR/PSL-1. /R4

7.2 Normal switching order log entries.

8.0 MATERIALS AND EQUIPMENT REQUIRED:

8.1 Real time analyzer and associated equipment, or equivalent.

8.2 Megger and Simpson 260 or equivalent.

8.3 Lifting equipment (chainfalls, slings, comealongs, etc). /R4

8.4 Electrician handtools. /R4

8.5 Variable AC source 0-150V 60 HZ.

8.6 Wrenches, sockets.

8.7 Rags.

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8.0 MATERIALS AND EQUIPMENT REQUIRED: (continued)

8.8 Air dryer.

8.9 Vacuum cleaner.

8.10 Scotch brite pads, contact cleaner.

8.11 Form 3946.

8.12 Frequency Meter.

8.13 Eight Channel Chart Recorder /R4

8.14 Two Channel Chart Recorder /R4

8.15 Fluke V.O.M. with clamp-on and temperature probe attachments /R4

8.16 Volt. Frequency and amperage transducers /R4

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9.0 GENERAL INSTRUCTIONS:

THE ENTIRE "GENERAL INSTRUCTIONS" SECTION OF THIS PROCEDURE HAS BEEN RE-WRITTEN

NOTE
All items with * designate ongoing environmental qualification of equipment. These readings and/or information should be compared with original test data.

9.1 Prior to plant shutdown (18 mo.) install temporary chart recorders and/or instruments to monitor diesel output for ECCS test procedure 2-0400050.

LOCATION	MONITOR	INIT/DATE
Diesel Control CAB	Gen. Voltage Gen. Frequency VMR Dry Contact FMR Dry Contact	___/___
2A3 4160 V SWGR	Gen. Amperes	___/___
*Diesel Generator	Stator Temperature	___/___

(Request I & C Department to make this set up)

NOTE
See attached drawings for termination details of above items.

9.2 During ECCS test observe diesel start at diesel control cabinet. Verify proper speed light sequence. ___/___

9.3 Obtain start time from operations "Sequence of Events" recorder. This is done by subtracting initiation of test time from diesel output breaker closure time. ___/___

Time_____Seconds

9.4 During the diesel run of the ECCS test, after load has been stabilized, record the following information:

1. Vibration Signature
Using "Snapshot" or equivalent equipment, take a vibration signature of the generator bearings and attach a copy of it to this procedure. ___/___

* 2. Generator Stator Temperature
Record the average stabilized temperature of those taken in Step 9.1. ___/___

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9.0 GENERAL INSTRUCTIONS: (continued)

9.4 (continued)

INIT/DATE

* 3. Generator Bearing Temperatures
After 1 hour of running at rated load, use a hand held temperature probe on bearing housings and record

16 Cyl_____

12 Cyl_____ ____/____

* 4. Ambient Air Temperature
Record ambient air temperature in diesel room, and air entering the generator.

Room Temp._____°F

Intake Gen. Temp._____°F ____/____

* 5. Field Current
Using a clamp on ammeter on secondary side of C.T. for field current, record stabilized field amps at rated load on generator.

_____Amps ____/____

* 6. Neutral Current
Using a digital Fluke voltmeter, measure the voltage drop across the grounding transformer resistor at TB 4-20 and TB 4-31.

_____Volts

Calculate neutral current

I = E/R R = 1.34 ohm

_____Neutral Amps ____/____

9.5 At the end of the ECCS run of the diesel, have Operations unload diesel and open the output breaker.

1. Check operation of the voltage regulator in local and remote. Verify voltage control between 4000 VAC and 4300 VAC.

Remote ____/____

Local Auto ____/____

Local Remote ____/____

2. Observe operation of governor controls. Check for smooth operation by varying speed control between 58 Hz - 62 Hz.

Remote ____/____

Local ____/____

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9.0 GENERAL INSTRUCTIONS: (continued)

		INIT/DATE
9.6	At the end of one (1) hour run, request a clearance on "2A Diesel". Clearance should include the following:	/
	1. Breaker 2-20211 (2A3 4160 V Bus) - Racked out.	/
	2. Remote Control Switch (On Load Panel) - Isolate.	/
	3. 125V DC - Bus 2A CKT 37 CWD 1608.	/
	4. MCC 2A7 Breakers 2-41407, 2-41408, 2-41409, 2-41411, CWD 1120, 1121, 1607.	/
	5. 125V DC Bus 2A CKT 22.	/
	6. Voltmeter and wattmeter for 2A diesel on HSCP should be removed and calibrated at this time.	/
9.7	Remove breaker 2-20211 from cubicle. Ground generator per "Grounding and Testing" Procedure No. 0920062.	/
9.8	Pull Generator PT fuses. Remove leads off grounding transformer in Generator Control Cabinet. Remove cables off lighting arrestors.	/
	Verified_____	

NOTE
Prior to performance of Steps 9.9, 9.10, 9.12 discuss with electrical supervisor.

*	9.9	Megger at 5000 V and Doble Diesel Generator from ground device. Ensure proper safety rules are adhered to. Record Doble readings on Form 3946, megger readings/ polarization index on Form 2210.	/
*	9.10	Record D.C. leakage current with 1.7 P.U. rated voltage stress (7072 volts) on stator windings.	/
*	9.11	Record winding resistance on stator and rotor _____Stator _____Rotor	/
	9.12	Record bearing insulation resistance or leakage current. _____Ohms _____Amps	/
	9.13	Ground generator with grounding device. Verified_____	/

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9.0 GENERAL INSTRUCTIONS: (continued)

INIT/DATE

* 9.14 Remove end bell screens and make the following inspection: ___/___

1. Inspect brushes for wear and correct seating and spring tension. Notify Foreman/Supervisor when inspecting. ___/___

2. Inspect inside of generator for any unusual conditions. Cleanliness, oil leak, etc. Notify Foreman/Supervisor of any abnormalities. ___/___

9.15 Blow out generator with dry air, and wipe down with clean, lint-free rags. ___/___

9.16 Replace end bell screens after inspection and cleaning. Clean all surfaces. ___/___

* 9.17 Inspect generator lead box. Inspection should include: loose connections, deterioration of wires, taping of leads, etc. Clean insulators and vacuum cabinet. ___/___

9.18 Inspect control cabinets. Inspection should include: Check tightness of all connections, visual inspection of relays, switches, and wiring. Remove fuses and clean with scotch brite pads. Change out deteriorated fuses. Vacuum cabinet. ___/___

1. Inspect voltage regulator cabinet. Check for loose connections and visually inspect components. Vacuum cabinet. ___/___

2. Check transformers and CT's and cables. Clean insulators. Vacuum cubicle. Tighten connections. ___/___

NOTE
Notify Foreman/Supervisor of any abnormalities. Note on PWO any findings.

9.19 Megger generator from ground device. Record megger readings on form 2210. ___/___

Readings should be greater than or equal to readings taken in Step 9.9.

9.20 Change governor hydraulic actuator oil on both engines with N-100 oil. Fill to specified level on actuator sight glass. Follow Section 12 of Tech. Manual "Centrifugal Governor Compensation," to vent air out of actuators during run.

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9.0 GENERAL INSTRUCTIONS: (continued)

> CAUTION
> IF VENTING PROCEDURE IS NOT FOLLOWED, OVERSPEED OF ENGINE COULD RESULT.

> NOTE
> Steps 9.21, 9.22, 9.23, and 9.24 will be performed with an electrical engineers direction.

INIT/DATE

9.21 Select (10) ten relays from the following list and isolate or remove from the circuit to perform the tests required. ____/____

1. Operate the relays for 10 cycles before taking measurements. Apply a 100 ma load through the contacts and measure the voltage drop. If any of the 10 relays has a resistance greater than 100 milliohms, replace that relay and perform this test on all KPD-13 relays in the panels. Replace all having contact resistance greater than 100 milliohms. ____/____

2. Measure the coil resistance of the 10 relays. If the value is outside the range of 5885 to 7195 ohms, replace that relay and perform this test on all KPD-13 relays in the system. ____/____

3. Using a 500 volt megger, check the insulation resistance of the 10 relays. It should be greater than 10 megs at 500V. If any relay is less than 10 megs, replace that relay and perform this test on all KPS-13 relays. ____/____

4. Visually inspect all 10 relays. Note the appearance and record any noticeable changes, (burned contacts, brittle housing, etc.). Contact the manufacturer for evaluation of these changes. ____/____

5. Perform the above tests on all Square D Contactors in the system. ____/____

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9.0 GENERAL INSTRUCTIONS: (continued)

INITIAL

9.22 Agastat Timing Relays

1. Measure and record the time delay. If this value changes from the initial value by more than ±30%, replace the relay. _____

2. Measure and record the D.C. resistance of the coil. The value must be between 1710 and 2090 ohms. If the value is not within this range, replace the relay. _____

3. Measure and record the contact resistance. If the contact resistance is above 150 milliohms, replace the relay. Operate the relay for 10 cycles prior to taking this reading. _____

DEVICE	TIME DELAY		COIL RESISTANCE	CONTACT RESISTANCE
	REQUIRED TIME	ACTUAL		
TDV				
TDY				
TD5X				
TD1				
TD3				
TD5				
TD8				

9.23 Wilmar Electric Devices for frequency and voltage monitoring.

1. Isolate the relays from the circuit. _____

2. Operate the relays for 10 cycles, then measure and record the contact resistance. If greater than 100 milliohms, replace the relay. _____

   Frequency_____m ohms Voltage_____m ohms

3. Measure and record the coil resistance. If this value changes from the initial reading by more than ±10%, replace the relay. _____

   Frequency Coil_____ Voltage Coil_____

4. Visually inspect the relays and record their condition. _____

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9.0 GENERAL INSTRUCTIONS: (continued)

INIT/DATE

9.24 10-Year Test of General Electric SIS Wire.

NOTE
Six wire test specimens are included in the engine control panel.

1. Insulation megger test must be greater than 500 megohms. ____/____
   Test Specimen No._____

2. Hi-Pot Test
   Test Specimen No._____

3. Visual Inspection
   Test Specimen No._____

   A decrease of the insulation resistance below 50 megohms, failure of the Hi-Pot Test or significant degradation of the wire detected by visual inspection requires the condition of the system wiring be evaluated by the manufacturer.

TEST SPECIMEN	TEST SCHEDULE
1	On Installation
2	In 10 years (1990)
3	In 20 years (2000)
4	In 30 years (2010)
5	Spare
6	Spare

9.25 Replace leads on grounding transformer and PT fuses and lighting arrestors. Take grounding device out of cubicle. Replace breaker in cubicle. ____/____

9.26 Release clearance, notify Operations diesel is ready for functional test. Obtain permission to conduct one (1) hour load test and do Section 9.1 VMR and FMR Monitoring. ____/____

9.27 At the end of final test and satisfactory results, remove all monitoring equipment and notify Operations diesel is ready for service. ____/____

9.28 Clean up areas of work. Put tools and equipment away. ____/____

Completed by:_____

Verified by (Foreman):_____

Reviewed by (Supv.):_____

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DEVICES IN ENGINE CONTROL PANEL

DEVICES	TEST YEAR	CONTACT RESISTANCE	COIL RESISTANCE	INSULATION RESISTANCE	VISUAL INSPECTION
R1	1984				
R1X	1984				
R1X1	1984				
R1X2	1984				
R9	1984				
R9X	1984				
AV1A	1984				
AV1B	1984				
AV2A	1985				
AV2B	1985				
SDR	1985				
SDRX	1985				
SDRX1	1985				
SDRX2	1985				
LA	1985				
LB	1985				
RA	1986				
RB	1986				
R2	1986				
OTA	1986				
OTB	1986				
BF1	1986				
BF5	1986				
BF6	1986				
BF7	1984				
BF8	1985				
FFP (CONTACTOR)	1984				

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DEVICES IN RELAY PANEL

DEVICES	TEST YEAR	CONTACT RESISTANCE	COIL RESISTANCE	INSULATION RESISTANCE	VISUAL INSPECTION
IR	1984				
KA	1984				
KB	1985				
UC	1985				
UD	1986				
OTS	1986				

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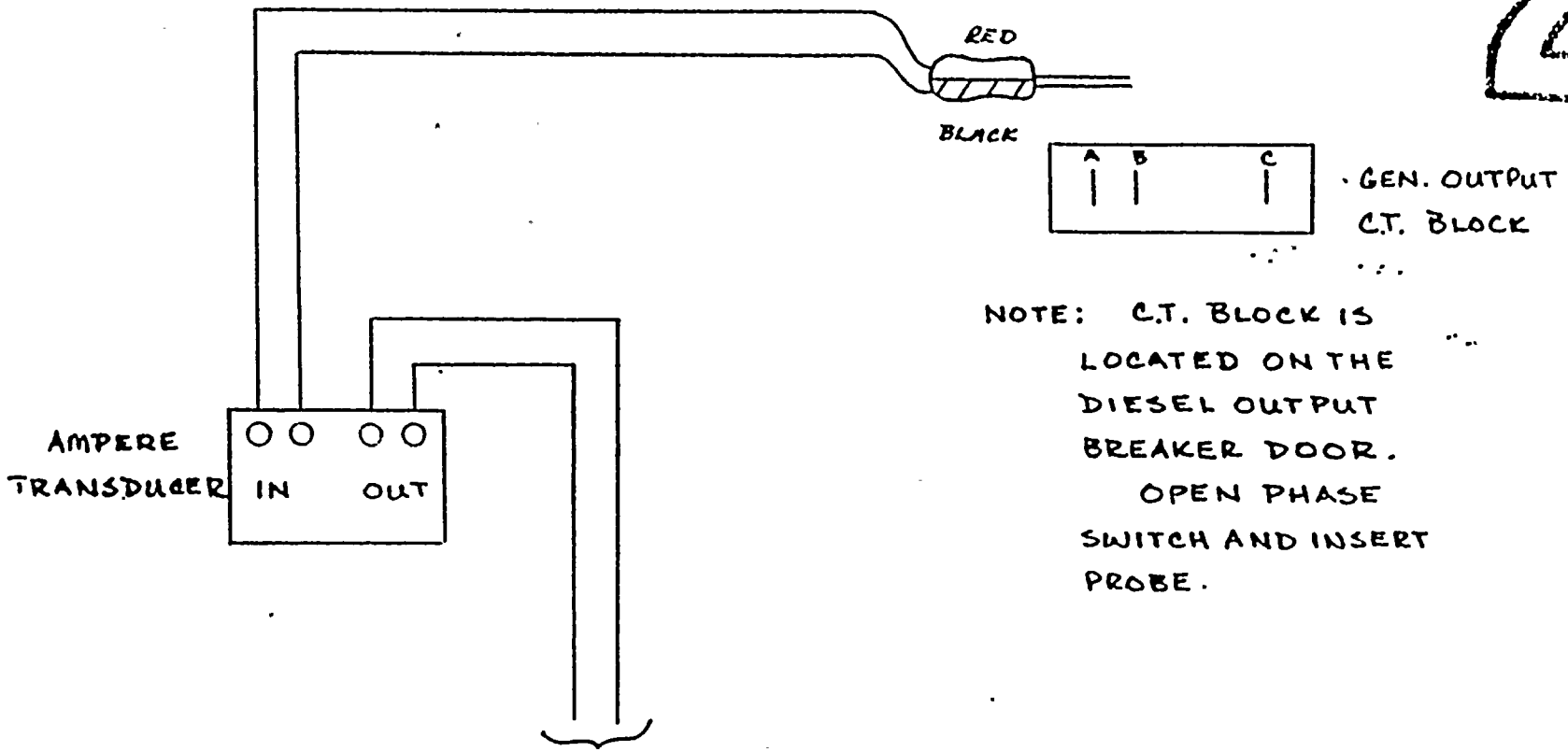
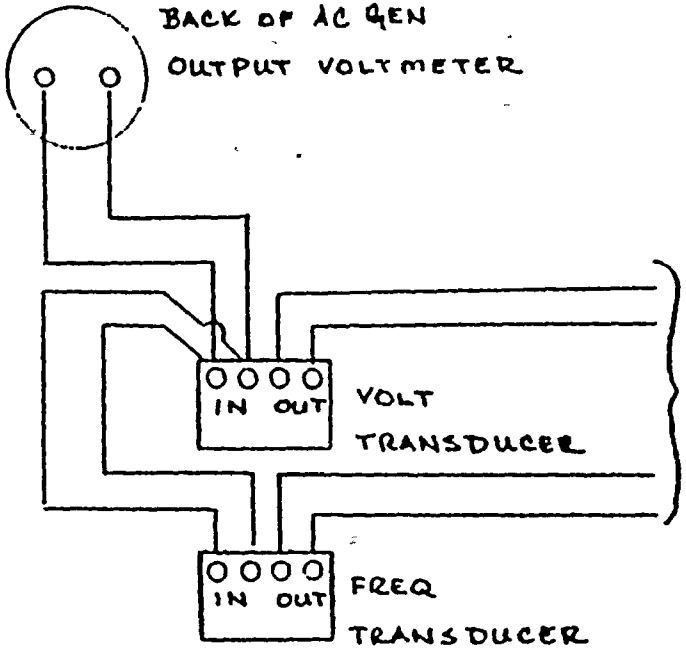
INSTRUMENTATION HOOKUPS
(SWITCHGEAR ROOM)



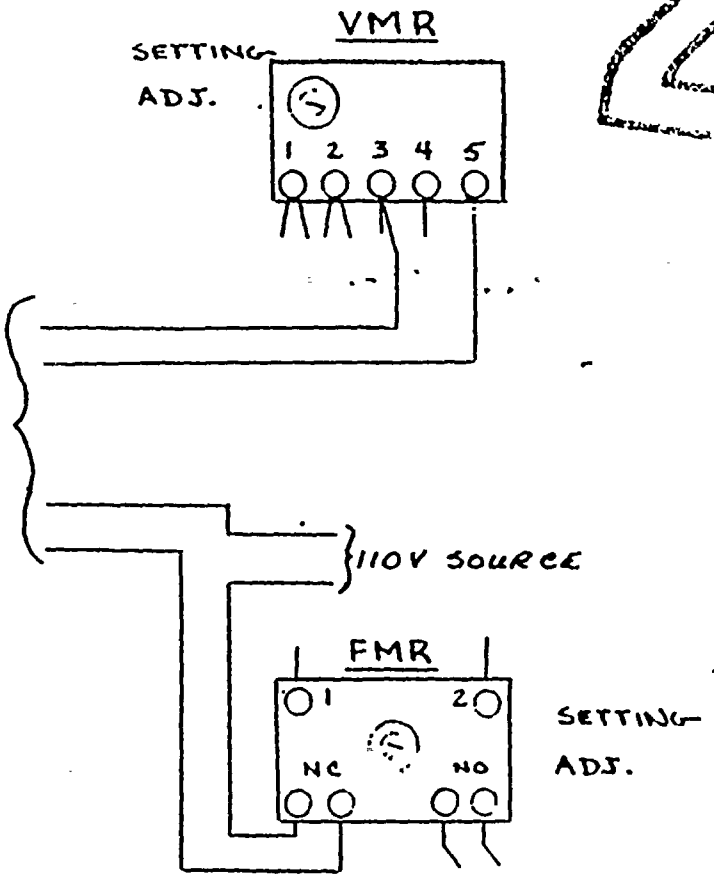
2

INSTRUMENTATION HOOKUPS (DIESEL BUILDING)

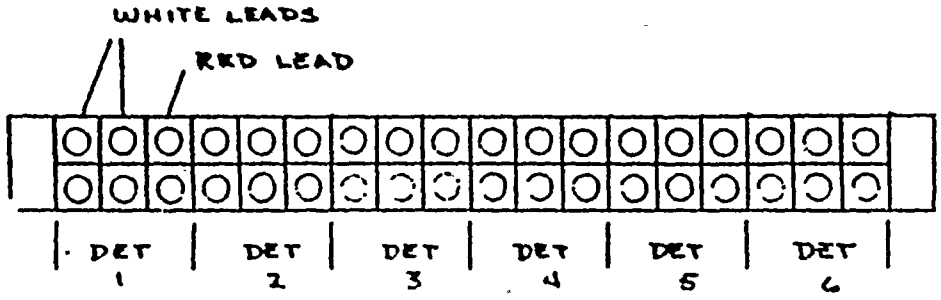
VOLTAGE/FREQUENCY



VMR/FMR



GENERATOR STATOR TEMPERATURE



NOTE: - TERM. BOX FOR RTD'S IS LOCATED ON GEN
- RTD IS 100HMS AT 25°C