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Entergy Nuclear Northeast	Procedure Use Is: ☑ Continuous □ Reference □ Information	Control Copy: Effective Date: <u>3/22/08</u> Page 1 of 36				
Energy Center						
2-OSP-27.6, Revision: 0 SUPPORT PROCEDURE - UNIT 2 APPENDIX R DIESEL GENERATOR OPERATION						
Approved By:		Adian Point				
Procedure Sponsor, DM/Designee	<u> </u>	Peration				
Team 2A						
Procedure Owner						
NEW PROCEDURE						

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REVISION SUMMARY

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1.0 REASONS FOR REVISION

1.1 New Procedure to incorporate EC 5000033794, IP2 Station Blackout and Appendix R Diesel Generator Set.

2.0 SUMMARY OF CHANGES

2.1 This is a Rev. 0 procedure.

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1.0 PURPOSE

1.1 This procedure establishes requirements for operation of the Unit 2 Appendix R Diesel Generator.

2.0 PRECAUTIONS AND LIMITATIONS

- 2.1 TRO 3.8.B applies in Modes 1, 2, 3 and 4.
- 2.2 The Appendix R Diesel Generator maximum continuous load is 2045 kW. During an emergency, maximum generator load is 2435 kW.
- 2.3 Do <u>NOT</u> operate the engine less than 750 KW for long periods of time. Idling for a prolonged period of time (more than 30 minutes) can damage an engine. Running with engine coolant temperature too low (below 140°F) will dilute crank case oil with raw fuel.
- 2.4 Crankcase oil level should only be checked using the lube oil reservoir gauge glass when the engine is running. Removing the engine oil fill cap or dipstick can allow hot oil to splash out.
- 2.5 Pushing the Emergency Stop button <u>OR</u> placing the 0/Manual/Auto switch to the 0 position will cause an immediate engine shutdown (bypassing the cooldown at idle). This hot shutdown should be avoided, if possible, to prolong reliability of engine.

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3.0 PREREQUISITES

- 3.1 Lube Oil Supply Reservoir gauge glass level indicates between 3/4 and FULL.
- 3.2 The following Appendix R Diesel Generator Fuel Day Tank Indications are extinguished:
 - Tank Rupture
 - System Fail
 - Critical High
 - High Fuel
 - Low Fuel
 - Pump 2 Fail
 - Pump 1 Fail
- 3.3 The Appendix R Diesel Generator Fuel Day Tank Level Gauge indicates between 7/8 and FULL.

<u>NOTE</u>

When the system heats up and the coolant expands, the surge tanks should indicate between 2/3 and 3/4 full. This reserves 1/4 to 1/3 of the tank volume to accommodate system surges.

- 3.4 The following coolant surge tank levels are within range:
 - Jacket Water Surge Tank level between 1/4 and 1/3 full (cold level)
 - After Cooler Surge Tank level between 1/4 and 1/3 full (cold level)
- 3.5 The Appendix R DG Auxiliary Transfer Switch is aligned to MCC 22 or Temporary AC Source as follows: (Appendix R DG Auxiliaries MCC)
 - 3.5.1 Source 1 Available (White Light Illuminated)
 - 3.5.2 Source 1 Connected (Green Light Illuminated)

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4.0 PROCEDURE

4.1 Lining Up 13.8KV Feeder 13W92 To The SBO/APP R BUS

- 4.1.1 REQUEST the CRS to refer to Technical Specification 3.8.1.
- 4.1.2 <u>IF</u> the Appendix R DG will be paralleled to 13W92, <u>THEN</u> REQUEST the CCR to notify the SO.
- 4.1.3 ENSURE the following breakers are OPEN:
 - • Main GT Breaker
 - GT25
 - ----- GT26
 - ----- 52GT/BT
 - ----- ASS
 - ----- SBO/ASS
- _____ 4.1.4 ENSURE the following breakers are CLOSED:
 - ----- SBOH
 - ----- SBOL
 - ----- OSP

4.2 Securing Line Up From Feeder 13W92

- _____ 4.2.1 ENSURE the following breakers are OPEN:
 - BO/ASS
 - ----- SBOL
 - ----- SBOH

4.3 Lining Up 13.8KV Feeder 13W93 To The SBO/APP R Bus

- _____ 4.3.1 ENSURE the following breakers are OPEN:
 - • SBO/ASS
 - ----- SBOH
- _____ 4.3.2 ENSURE breaker ASS is CLOSED.

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4.4 Securing Line Up From Feeder 13W93

- 4.4.1 ENSURE the following breakers are OPEN:
 - ----- SBO/ASS
 - ----- ASS

4.5 Preparing For Engine Start

4.5.1 PERFORM any required test line up per test procedure.

<u>NOTE</u>

- Opening the Tool Room roll-up door may affect Centac operation. CCR permission is required prior to opening the Tool Room roll-up door.
- The design maximum temperatures for the Unit 2 Appendix R DG are:
 - 104°F for the electrical distribution equipment
 - 122°F for the Diesel Generator air intake
 - 4.5.2 PERFORM the following as necessary to prevent exceeding design maximum temperatures:
 - 4.5.2.1 <u>IF</u> the Tool Room roll-up door will be opened, <u>THEN</u> REQUEST permission from the CCR to open the Tool Room roll-up door.
 - _____ 4.5.2.2 ENSURE <u>one</u> of the following is open:
 - The Maintenance Loading Bay overhead door (15' Elevation)

<u>OR</u>

- -- Tool Room roll-up door (15 'Elevation)
- 4.5.3 ALIGN FOP-11, Fuel Oil Pump, as follows: (Fuel Oil Pump Room)
 - --- CLOSE GT1-GT33, GT1-FOP-11 Discharge Stop.
 - OPEN GT1-GT25, GT1-FOP-11 Discharge Test Connection Stop Valve.
- _____ 4.5.4 ROTATE Fuel Oil Forwarding Pump #1 Manual Transfer Switch to the SBO/APP R DG Position. (Fuel Oil Pump Room)
- _____ 4.5.5 ENSURE DF-152, Appx R Diesel Generator Day Tank Fuel Oil Return Valve, is OPEN.

- 4.5.6 ENSURE the Appendix R Diesel Generator Fuel Oil Day Tank System Ready yellow LED is flashing.
- 4.5.7 PERFORM the following at the Appendix R DG Day Tank Control Panel:
 - _____ 4.5.7.1 PRESS the System Test switch.
 - a) CHECK all LEDs on the control panel are illuminated.
 - _____ b) RELEASE the System Test switch.
 - 4.5.7.2 PRESS the Alarm Test switch to test the alarm level and pump fail functions.
 - _____a) RELEASE the Alarm Test switch.
 - 4.5.7.3 CHECK <u>NO</u> abnormal condition exists as indicated by an LED in a flashing ON state and horn sounding.
- 4.5.8 <u>IF</u> the Appendix R DG will be paralleled to the grid <u>THEN</u> PLACE the UNIT-PARALLEL switch in PARALLEL. (SBO/ APP R Switchgear 6.9KV Bus)
 - _____ 4.5.9 <u>IF</u> the Appendix R DG will be powering an isolated (dead) bus <u>THEN</u> PLACE the UNIT-PARALLEL switch in UNIT.
 - _ 4.5.10 ENSURE the following conditions exist at the Appendix R DG Switch Panel: (Control Panel)
 - Shutdown Status indicator Extinguished
 - ----- Warning Status indicator Extinguished
 - Alarm Module, Alarm LED Extinguished
 - Alarm Module, Horn Silenced LED Extinguished
- 4.5.11 PERFORM the following at the Appendix R DG Switch Panel: (Control Panel)
 - 4.5.11.1 PRESS <u>AND</u> HOLD the Panel Lamp/Lamp Test button for at least 3 seconds.
 - 4.5.11.2 CHECK all control panel LEDs illuminate.
 - 4.5.11.3 RELEASE Panel Lamp/Lamp Test button.

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<u>CAUTION</u>

- When aligning Service Water to supply cooling to the Appendix R DG Heat Exchangers, placing Service Water in service slowly ensures flow will <u>NOT</u> adversely affect the operation of the conventional Service Water header.
- Do <u>NOT</u> check lube oil level using the engine mounted dipstick while the generator set is operating. Crankcase pressure can blow out hot oil and cause severe burns.
 - 4.5.12 IF Service Water will be the cooling source, <u>THEN</u> ALIGN Service Water to the Appendix R DG as follows:
 - _____ 4.5.12.1 OPEN SWT-837.
 - _____ 4.5.12.2 ADJUST Cooling Water flow as follows:
 - a) THROTTLE UW-840 to achieve approximately 137 gpm as indicated by FI-7980, Aftercooler Water Flow.
 - b) THROTTLE UW-836 to achieve approximately 185 gpm as indicated by FI-7979, Jacket Water Flow.
 - 4.5.13 <u>IF</u> City Water will be the cooling source, <u>THEN</u> ALIGN City Water to The Appendix R DG as follows:
 - _____ 4.5.13.1 OPEN the following:
 - _____ a) UW-854
 - _____ b) UW-855
 - _____ 4.5.13.2 ADJUST Cooling Water flow as follows:
 - a) THROTTLE UW-840 to achieve approximately 87 gpm as indicated by FI-7980, Aftercooler Water Flow.
 - b) THROTTLE UW-836 to achieve approximately 118 gpm as indicated by FI-7979, Jacket Water Flow.
 - 4.5.14 <u>IF</u> de-energizing the Appendix R DG Auxiliaries MCC, <u>THEN</u> OPEN the temporary AC Feed.

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4.6 Normal Engine Start (Manual Mode)

<u>NOTE</u>

- There is no time delay when starting the engine in manual mode.
- The default starting sequence is 3 start cycles, comprised of 10 seconds of cranking and 10 seconds of rest.
- When the coolant reaches operating temperature <u>OR</u> the warm-up at idle time is completed, the generator will ramp up to rated speed and voltage.
 - 4.6.1 ENSURE that Section 4.5, Preparing For Engine Start, has been performed.
 - 4.6.2 TURN the 0/MANUAL/AUTO switch to the MANUAL position.
 - 4.6.3 PRESS AND RELEASE the Manual Run/Stop button.

- The <u>\</u> momentary pushbutton on Menu A of the Operator Panel is used to close and open breaker SBO/ASS.
 - __ indicates breaker SBO/ASS is open, PUSH to close
 - _-_ indicates breaker SBO/ASS is closed, PUSH to open
- When using the __ momentary pushbutton, breaker SBO/ASS will close only when set-up conditions allow (i.e. dead bus <u>OR</u> generator synchronized with bus).
 - 4.6.4 IF Manually closing breaker SBO/ASS, THEN PRESS the Manual Close Button on the front of the Breaker.
 - 4.6.5 CLOSE breaker SBO/ASS as follows:
 - _____ 4.6.5.1 PRESS <u>AND</u> HOLD the __ momentary pushbutton until the symbol indicates _- (breaker SBO/ASS closed).
 - _____ 4.6.5.2 RELEASE the momentary pushbutton.

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4.7 Normal Engine Start (Auto Mode)

- The default crank starting sequence is 3 start cycles, comprised of 10 seconds of cranking followed by 10 seconds of rest.
- There will be a delay of ten seconds from pressing the start button until the start of the engine to allow the operator to move away from the engine.
- When the coolant reaches operating temperature <u>OR</u> the warm-up at idle time is completed, the generator will ramp up to rated speed and voltage.
 - 4.7.1 ENSURE that Section 4.5, Preparing For Engine Start, has been performed.
 - 4.7.2 PERFORM the following on the LCD display:
 - _____ 4.7.2.1 SELECT CONTROL.
 - _____ 4.7.2.2 SELECT START GENSET.
 - _____ 4.7.3 CHECK the following:
 - _____ 4.7.3.1 Engine starts
 - _____ 4.7.3.2 Engine comes up to rated speed
 - 4.7.3.3 Generator synchronizes to the bus
 - 4.7.3.4 Generator picks up the nominal load

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4.8 Diesel Generator Operation

- A fault that could result in engine damage causes an immediate engine shutdown.
- All other faults allow the engine to run during the cooldown sequence before engine shutdown.
- Warning alarms will NOT cause a shutdown, but may indicate abnormal operation.
 - 4.8.1 <u>IF</u> a Warning Condition occurs (Warning Status Indicator illuminates yellow), THEN PERFORM the following:
 - 4.8.1.1 IF the Alarm Module warning horn annunciated, <u>THEN</u> momentarily PUSH the PUSH TO SILENCE HORN button.
 - _____ 4.8.1.2 REFER to the following for assistance in correcting the condition:
 - ATTACHMENT 2, WARNING AND SHUTDOWN FAULT CODES
 - ATTACHMENT 3, APPENDIX R DG TROUBLESHOOTING PROCEDURES
 - _____ 4.8.1.3 <u>WHEN</u> the condition is corrected, <u>THEN</u> the Warning Status Indicator may be reset as follows:
 - a) PRESS FAULT ACKNOWLEDGE button. (front panel)

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<u>NOTE</u>

- If a Shutdown Fault occurs while in AUTO, then STOP GENSET must be selected before the Shutdown Fault can be reset. The engine will restart automatically if the fault is reset prior to selecting STOP GENSET.
- If a shutdown condition occurs, the Shutdown Status Indicator will illuminate red and the engine will shutdown immediately <u>OR</u> on a cooldown timer at any time an abnormal condition is sensed.

4.8.2	IF a shutdown condition occurs (Shutdown Status Indicator illuminates red), THEN PERFORM the following:					
	4.8.2.1	IF the Alarm Module warning horn annunciated, THEN momentarily PUSH the PUSH TO SILENCE HORN button.				
	4.8.2.2	IE in AUTO, THEN PERFORM the following:				
		a) <u>WHEN</u> the engine stops, <u>THEN</u> PERFORM the following on the LCD display:				
		1) SELECT CONTROL.				
		2) SELECT STOP GENSET.				
<u></u>	4.8.2.3	REFER to the following for assistance in correcting the condition:				
		ATTACHMENT 2, WARNING AND SHUTDOWN FAULT CODES				
		ATTACHMENT 3, APPENDIX R DG TROUBLESHOOTING PROCEDURES				
······	4.8.2.4	PERFORM the following to reset the shutdown condition:				
		a) IF the EMERGENCY STOP button was pressed, THEN PULL the EMERGENCY STOP button out.				
		b) PLACE the 0/MANUAL/AUTO switch in 0.				
		 PRESS the front panel FAULT ACKNOWLEDGE button. 				
		d) PLACE the 0/MANUAL/AUTO switch in AUTO.				

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 4.8.3	IF desired to ALIGN the Appendix R DG Auxiliaries MCC to the Appendix R DG, THEN PERFORM the following:						
	4.8.3.1	4.8.3.1 CHECK the generator is at rated speed and voltage as indicated by the LCD display message.					
	4.8.3.2	ENSURE the Appendix R DG Auxiliary Transfer Switch is aligned as follows:					
		a) CHECK Source 2 Available (Yellow Light illuminated).					
	4.8.3.3	PLACE the Appendix R DG Auxiliaries NORMAL/STANDBY switch in the NORMAL position (aligned to the Appendix R DG Output). (Appendix R DG Auxiliaries MCC)					
		a) CHECK Source 2 Connected (Red Light illuminated).					
 4.8.4	CHECK th	at the DG Area Fan is running.					
 4.8.5	ADJUST of temperatu	ADJUST cooling water throttle valves to maintain normal cooling temperatures:					
	• UW-8	336					
	• UW-8	340					
 4.8.6	<u>IF</u> it is des <u>THEN</u> PEI	ired to adjust diesel generator load, RFORM the following:					
	4.8.6.1	SELECT Base Load using the arrow key from the UTILITY Menu.					
	4.8.6.2	ADJUST load as desired using the "+" or "-" keys.					
 4.8.7	<u>IF</u> it is des <u>THEN</u> PEI	ired to adjust diesel generator VARs, RFORM the following:					
	4.8.7.1	SELECT PF LEVEL using the arrow key from the UTILITY Menu.					
	4.8.7.2	ADJUST VARs as desired using the "+" or "-" keys.					
 4.8.8	RECORD ATTACHM	Appendix R DG parameters if desired using IENT 1, APPENDIX R DG DATA SHEET.					

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NOTE

When the Appendix R DG Day Tank is operating in AUTO, the Appendix R DG Day Tank Level should be maintained between 7/8 and FULL.

- 4.8.9 MONITOR Appendix R DG Day Tank Level.
- 4.8.10 MONITOR Lube Oil Supply Reservoir gauge glass level.
 - 4.8.10.1 <u>IF</u> gauge glass level indicates less than 1/4 full, <u>THEN</u> REFILL Lube Oil Supply Reservoir with proper grade of oil (SAE 15W - 40).
- 4.8.11 CHECK the engine systems for leakage.
 - _____ 4.8.11.1 <u>IF</u> leakage is observed, <u>THEN</u> INITIATE a WR as necessary.

4.9 Normal Engine Shutdown (Manual Mode)

- _____ 4.9.1 REQUEST the CCR to notify the SO that the Appendix R DG will be unloaded.
- _____ 4.9.2 IF desired to transfer Appendix R DG Auxiliaries to MCC 22 or Temporary AC Power, THEN PERFORM the following:
 - 4.9.2.1 ENSURE the Appendix R DG Auxiliary Transfer Switch is aligned as follows:
 - _____a) CHECK Source 1 Available (White Light illuminated).
 - 4.9.2.2 PLACE the Appendix R DG NORMAL/ STANDBY switch in the STANDBY position (aligned to MCC 22). (Appendix R DG Auxiliaries MCC)
 - _____a) CHECK Source 1 Connected (Green Light illuminated).
- 4.9.3 PRESS AND RELEASE the Manual Run/Stop button.
 - 4.9.3.1 ENSURE breaker SBO/ASS is Open. (SBO/APP R Diesel Generator Switchgear)

4.10 Normal Engine Shutdown (Parallel Mode)

_____ 4.10.1 REQUEST the CCR to notify the SO that the Appendix R DG will be unloaded.

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- ____ 4.10.2 <u>IF</u> desired to transfer Appendix R DG Auxiliaries to MCC 22 or Temporary AC Power, THEN PERFORM the following:
 - _____ 4.10.2.1 ENSURE the Appendix R DG Auxiliary Transfer Switch is aligned as follows:
 - a) CHECK Source 1 Available (White Light illuminated).
 - 4.10.2.2 PLACE the Appendix R DG NORMAL/ STANDBY switch in the STANDBY position (aligned to MCC 22). (Appendix R DG Auxiliaries MCC)
 - _ a) CHECK Source 1 Connected (Green Light illuminated).

<u>NOTE</u>

- The preset cooldown time (at rated speed) will vary dependent on the kW output.
- The generator will stop after the cooldown at idle time is completed.
 - 4.10.2.3 PERFORM the following on the LCD display:
 - _____ a) SELECT CONTROL.
 - _____b) SELECT STOP GENSET.
 - _____ 4.10.2.4 ENSURE breaker SBO/ASS is open. (SBO/APP R Diesel Generator Switchgear)

4.11 Post Engine Run Line Up

- 4.11.1.1 RESTORE breaker line up using the applicable procedure section.
- ____ 4.11.1.2 PLACE the UNIT/PARALLEL switch in UNIT. (SBO/APP R Switchgear 13.8KV Bus)
- 4.11.1.3 IF the Appendix R DG Heat Exchangers are aligned to Service Water, <u>THEN</u> ALIGN the Appendix R DG Heat Exchangers to City Water as follows:
 - a) CLOSE SWT-837 to secure Service Water flow.

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- _____b) OPEN the following:
 - _____ 1) UW-854
 - _____ 2) UW-855
- _____ c) ADJUST Cooling Water flow as follows:
 - THROTTLE UW-840 to achieve approximately 100 gpm as indicated by FI-7980, Aftercooler Water Flow.
 - 2) THROTTLE UW-836 to achieve approximately 100 gpm as indicated by FI-7979, Jacket Water Flow.
- d) WAIT a minimum of 5 minutes for City Water to flush residual service water from the Appendix R DG Heat Exchangers and piping.
- _____ 4.11.1.4 CLOSE the following to secure City Water to the Appendix R DG Heat Exchangers:
 - ____ a) UW-854
 - _____ b) UW-855
- _____ 4.11.2 CLOSE DF-152, Appx R Diesel Generator Day Tank Fuel Oil Return valve.
- 4.11.3 ALIGN FOP-11, Fuel Oil Pump, as follows: (Fuel Oil Pump Room)
 - CLOSE GT1-GT25, GT1-FOP-11 Discharge Test Connection Stop Valve.
 - OPEN GT1-GT33, GT1-FOP-11 Discharge Stop.
- 4.11.4 ROTATE Fuel Oil Forwarding Pump #1 Manual Transfer Switch to the Turbine Auxiliary MCC 88TPX. (Fuel Oil Pump Room)
- 4.11.5 CLOSE the roll-up door previously opened.
- _____ 4.11.6 ENSURE the Lube Oil Supply Reservoir is refilled with the proper grade of oil (SAE 15W 40).

4.12 Testing The SBO/APP R Diesel Generator In Unit Mode On 13W93

- _____ 4.12.1 ENSURE the Unit 3 13.8 KV circuit is being supplied by 13W92.
- _____ 4.12.2 ENSURE that breaker GT/2F is racked out.

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- 4.12.3 ENSURE that GT2 auxiliaries are transferred to their emergency supply (13W77) per 2-SOP-31.2.2, Gas Turbine 2 Local Operations.
- _____ 4.12.4 ENSURE that Assembly K has been transferred to emergency supply on 11EC4.
- 4.12.5 ENSURE the TSC Bus 2 has been transferred to 13W92.
- _____ 4.12.6 ENSURE the essential plant loads are supplied from 13.8KV L&P Buses 1, 2 and 4.
- _____ 4.12.7 ENSURE Feeder 13W93 is aligned to e SBO/App R Bus per Section 4.3.
- _____ 4.12.8 ENSURE that Alternate Safe Shutdown System (ASSS) loads are ready to be started.

<u>NOTE</u>

- Opening the Tool Room roll-up door may affect Centac operation. CCR permission is required prior to opening the Tool Room roll-up door.
- The design maximum temperatures for the Unit 2 Appendix R DG are:
 - 104°F for the electrical distribution equipment
 - 122°F for the Diesel Generator air intake
 - _____ 4.12.9 PERFORM the following as necessary to prevent exceeding design maximum temperatures:
 - 4.12.9.1 <u>IF</u> the Tool Room roll-up door will be opened, <u>THEN</u> REQUEST permission from the CCR to open the Tool Room roll-up door.
 - _____ 4.12.9.2 ENSURE <u>one</u> of the following is open:
 - Maintenance Loading Bay overhead door (15' Elevation)

<u>OR</u>

- Tool Room roll-up door (15 'Elevation)
- 4.12.10 ALIGN FOP-11, Fuel Oil Pump, as follows: (Fuel Oil Pump Room)
 - CLOSE GT1-GT33, GT1-FOP-11 Discharge Stop.
 - OPEN GT1-GT25, GT1-FOP-11 Discharge Test Connection Stop Valve.

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4.12.12 ENSURE DF-152, Appx R Diesel Generator Day Tank Fuel Oil Return valve, is OPEN. 4.12.13 ENSURE the Appendix R Diesel Generator Fuel Oil Day Tank System Ready yellow LED is flashing. 4.12.14 PERFORM the following at the Appendix R DG Day Tank Control Panel: 4.12.14.1 PRESS the System Test switch. CHECK all LEDs on the control panel are illuminated. a) b) RELEASE the System Test switch. 4.12.14.2 PRESS the Alarm Test switch to test the alarm level and pump fail functions. **RELEASE** the Alarm Test switch. a) 4.12.14.3 CHECK NO abnormal condition exists as indicated by an LED in a flashing ON state and horn sounding. 4.12.15 ENSURE the UNIT-PARALLEL switch is in UNIT. 4.12.16 ENSURE the following conditions exist at the Appendix R DG Switch Panel (Control Panel): Shutdown Status indicator - Extinguished ۲ Warning Status indicator - Extinguished • Alarm Module, Alarm LED - Extinguished ۰ Alarm Module, Horn Silenced LED - Extinguished • 4.12.17 PERFORM the following at the Appendix R DG Switch Panel: (Control Panel)

4.12.11 ROTATE Fuel Oil Forwarding Pump #1 Manual Transfer Switch to the

SBO/APP R DG Position. (Fuel Oil Pump Room)

- _____ 4.12.17.1 PRESS <u>AND</u> HOLD the Panel Lamp/Lamp Test button for at least 3 seconds.
- _____ 4.12.17.2 CHECK all control panel LEDs illuminate.
- _____ 4.12.17.3 RELEASE Panel Lamp/Lamp Test button.

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<u>CAUTION</u>

- When aligning Service Water to supply cooling to the Appendix R DG Heat Exchangers, placing Service Water in service slowly ensures flow will <u>NOT</u> adversely affect the operation of the conventional Service Water header.
- Do <u>NOT</u> check lube oil level using the engine mounted dipstick while the generator set is operating. Crankcase pressure can blow out hot oil and cause severe burns.
 - _ 4.12.18 IF Service Water will be the cooling source,

THEN ALIGN Service Water to the Appendix R DG as follows:

- _____ 4.12.18.1 OPEN SWT-837.
- 4.12.18.2 ADJUST Cooling Water flow as follows:
 - a) THROTTLE UW-840 to achieve approximately 137 gpm as indicated by FI-7980, Aftercooler Water Flow.
 - b) THROTTLE UW-836 to achieve approximately 185 gpm as indicated by FI-7979, Jacket Water Flow.
- _____ 4.12.19 <u>IF</u> City Water will be the cooling source, <u>THEN</u> ALIGN City Water to the Appendix R DG as follows:
 - _____ 4.12.19.1 OPEN the following:
 - ____ a) UW-854
 - _____ b) UW-855
 - 4.12.19.2 ADJUST Cooling Water flow as follows:
 - a) THROTTLE UW-840 to achieve approximately 87 gpm as indicated by FI-7980, Aftercooler Water Flow.
 - b) THROTTLE UW-836 to achieve approximately 118 gpm as indicated by FI-7979, Jacket Water Flow.

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<u>NOTE</u>

- There is no time delay when starting the engine in manual mode.
- The default starting sequence is 3 start cycles, comprised of 10 seconds of cranking and 10 seconds of rest.
- When the coolant reaches operating temperature <u>OR</u> the warm-up at idle time is done the generator will ramp up to rated speed and voltage.

_____ 4.12.20 TURN the 0/MANUAL/AUTO switch to the MANUAL position.

_____ 4.12.21 PRESS AND RELEASE the Manual Run/Stop button.

<u>NOTE</u>

- A fault that could result in engine damage causes an immediate engine shutdown.
- All other faults allow the engine to run during the cooldown sequence before engine shutdown.
- Warning alarms will NOT cause a shutdown, but may indicate abnormal operation.

4.12.22 <u>IF</u> a Warning Condition occurs (Warning Status Indicator illuminates yellow), THEN PERFORM the following:

- _____ 4.12.22.1 IF the Alarm Module warning horn annunciated, <u>THEN</u> momentarily PUSH the PUSH TO SILENCE HORN button.
- _____ 4.12.22.2 REFER to the following for assistance in correcting the condition:
 - ATTACHMENT 2, WARNING AND SHUTDOWN FAULT CODES
 - ATTACHMENT 3, APPENDIX R DG TROUBLESHOOTING PROCEDURES
- _____ 4.12.22.3 <u>WHEN</u> the condition is corrected, <u>THEN</u> the Warning Status Indicator may be reset as follows:
 - _____a) PRESS the front panel FAULT ACKNOWLEDGE button.

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<u>NOTE</u>

If a shutdown condition occurs, the Shutdown Status Indicator will illuminate red and the engine will shutdown immediately <u>OR</u> on a cooldown timer at any time an abnormal condition is sensed.

4.12.23 <u>IF</u> a shutdown condition occurs (Shutdown Status Indicator illuminates red),

THEN PERFORM the following:

- _____ 4.12.23.1 <u>IF</u> the Alarm Module warning horn annunciated, <u>THEN</u> momentarily PUSH the PUSH TO SILENCE HORN button.
- _____ 4.12.23.2 REFER to the following for assistance in correcting the condition:
 - ATTACHMENT 2, WARNING AND SHUTDOWN FAULT CODES
 - ATTACHMENT 3, APPENDIX R DG
 TROUBLESHOOTING PROCEDURES
- 4.12.23.3 PERFORM the following to reset the shutdown condition:
 - a) IF the EMERGENCY STOP button was pressed, <u>THEN</u> PULL the EMERGENCY STOP button out.
 - b) PLACE the 0/MANUAL/AUTO switch in 0.
 - ____ c) PRESS the front panel FAULT ACKNOWLEDGE button.
 - ____ d) PLACE the 0/MANUAL/AUTO switch in AUTO.
- 4.12.24 <u>IF</u> desired to ALIGN the Appendix R DG Auxiliaries MCC to the Appendix R DG, <u>THEN</u> PERFORM the following:
 - _____ 4.12.24.1 CHECK the generator is at rated speed and voltage, as indicated by the LCD display message.
 - _____ 4.12.24.2 ENSURE the Appendix R DG Auxiliary Transfer Switch is aligned as follows:
 - a) CHECK Source 2 Available (Yellow Light illuminated).

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		4.12.24.3	PLACE the Appendix R DG Auxiliaries NORMAL/STANDBY switch in the NORMAL position (aligned to the Appendix R DG Output). (Appendix R DG Auxiliaries MCC)					
			a) CHECK Source 2 Connected (Red Light illuminated).					
·····	4.12.25	CHECK the	at the DG Area Fan is running.					
Antonio	4.12.26	ADJUST cooling water throttle valves to maintain normal cooling temperatures:						
		• UW-8	36					
	<u> </u>	• UW-8	340					
	4.12.27	RECORD ATTACHM	Appendix R DG parameters if desired using IENT 1, APPENDIX R DG DATA SHEET.					
			NOTE					
When the Level shou	Appendix uld be ma	R DG Day	Tank is operating in AUTO, the Appendix R DG Day Tank tween 7/8 and FULL.					
	4.12.28	MONITOR	Appendix R DG Day Tank Level.					
	4.12.29	MONITOR	Lube Oil Supply Reservoir gauge glass level.					
	<u> </u>	4.12.29.1	<u>WHEN</u> gauge glass level indicates less than 1/4 full, <u>THEN</u> REFILL Lube Oil Supply Reservoir with proper grade of oil (SAE 15W - 40).					
<u></u>	4.12.30	CHECK the	e engine systems for leakage.					
		4.12.30.1	<u>IF</u> leakage is observed, <u>THEN</u> INITIATE a WR as necessary.					
	4 40 04	NEODA						

4.12.31 INFORM the CRS that Technical Specification, SAO 703 and ODCM Actions are applicable.

<u>NOTE</u>

The next step will de-energize 13.8KV L&P Bus 3.

- 4.12.32 REQUEST the CCR notify the DO to open breaker F3-1.
- 4.12.33 REQUEST the CCR obtain permission from the DO to energize feeder 13W93 from the Unit 2 Appendix R Diesel.

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<u>NOTE</u>

- The <u>\</u> momentary pushbutton on Menu A of the Operator Panel is used to close and open breaker SBO/ASS.
 - __ indicates breaker SBO/ASS is open, PUSH to close
 - _-_ indicates breaker SBO/ASS is closed, PUSH to open
- When using the __ momentary pushbutton, breaker SBO/ASS will close only when set-up conditions allow (i.e. dead bus <u>OR</u> generator synchronized with bus.

4.12.34 CLOSE breaker SBO/ASS.

<u>NOTE</u>

An announcement should be made prior to starting any equipment.

4.12.35 START the required ASSS loads.

4.12.36 SECURE the ASSS loads.

NOTE

The next step will de-energize 13.8KV L&P Bus 3.

- _____ 4.12.37 REQUEST the CCR make an announcement that 13.8KV L&P bus 3 will be de-energized.
- _____ 4.12.38 OPEN breaker ASS.
- _____ 4.12.39 REQUEST the CCR to restore 13.8KV L&P Bus 3.
- 4.12.40 SHUTDOWN the SBO/APP R Diesel Generator per Section 4.9, Normal Engine Shutdown (Manual Mode).
- _____ 4.12.41 RESTORE plant loads.
- 4.12.42 PERFORM Section 4.11, Post Engine Run Line Up.

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4.13 Manual Operations

- 4.13.1 <u>IF</u> desired to operate a breaker manually, <u>THEN</u> PERFORM the following:
 - _____ 4.13.1.1 <u>IF</u> closing the breaker, <u>THEN</u> PERFORM the following:
 - _____ a) <u>IF</u> the closing springs are discharged, <u>THEN</u> manually CHARGE using the charging tool.
 - _____ b) PRESS the Manual Close button.
 - _____ 4.13.1.2 <u>IF</u> opening the breaker, <u>THEN</u> PRESS the manual Trip button.

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5.0 **REFERENCES**

- 5.1 Commitment Documents
- 5.2 Development Documents
 - 5.2.1 TRM 3.8.B
 - 5.2.2 FSAR Chap. 8, Electrical Systems
 - 5.2.3 Operator's Manual, GenSet Model DQLA, DQLB, Cummins Power Generation 908-0111B, 07-2004
 - 5.2.4 QSK78(DQLA,DQLB) Control System, PowerCommand Control 3200, Publication No 3550(GB) Issue 2 - Aug '04
 - 5.2.5 Operator's Manual, PowerCommand 15 Amp @ 12 Volt and 12 Amp @ 24 Volt Battery Chargers, Cummins Power Generation 901-0105C, 9-2006
 - 5.2.6 FCM Fuel Control and Monitoring System, Detail Specifications, PYRCO, Inc.
 - 5.2.7 FCM Controls & Level Settings Tank Serial Number 453 9218, Tank Firmware Version: 01-05, PYRCO, Inc.
- 5.3 Interface Documents
 - 5.3.1 2-COL-27.6, Unit 2 Appendix R Diesel Generator.

6.0 RECORDS AND DOCUMENTATION

The following records are generated by this procedure and SHALL be maintained in accordance with IPEC Records Retention Schedule:

6.1 ATTACHMENT 1, APPENDIX R DG DATA SHEET

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ATTACHMENT 1 APPENDIX R DG DATA SHEET

(Page 1 of 1)

Date: _____

		TI	ME/ R	EADIN	IGS
PARAMETER	FULL LOAD				
Appendix R DG Engine Data					
Coolant Temperature	°F				
Lube Oil Pressure	psig				
Engine Speed	1800 RPM				
Battery Voltage					
Fuel Rail Pressure	psig				
Fuel Pump Pressure	psig				
Fuel Inlet Temperature	°F				
Coolant Pressure	psig				
Lube Oil Temperature	°F				
Lube Oil Level					
Appendix R DG Alternator Data					
L1 Amps	≤ 113.4 Amps				
L2 Amps	≤ 113.4 Amps				
L3 Amps	≤ 113.4 Amps				
Frequency	59.7 - 60.3 Hz				
Total kW	≤ 2700 kW				
Total kVA	≤ 3375 kVA				
Total PF	L			L	<u> </u>
Appendix R DG Other Data					
Day Tank Level	7/8 - FULL				ļ
PI-8030, Day Tank Fill Pump Pressure	psig				
TE-8027, Day Tank Oil Cooler Temperature	°F				
Lube Oil Reservoir Sight Glass Level	3/4 - FULL		L		
LG-8032, Jacket Water Surge Tank Sight Glass Level	2/3 - 3/4				
LG-8031, After Cooler Surge Tank Sight Glass Level	2/3 - 3/4				
TI-908, Jacket Water Heat Exchanger Outlet Temperature	۴				
TI-909 After Cooler Heat Exchanger Outlet Temperature	°F				
FI-7979, Appendix R DG Jacket Water Flow (City Water) FI-7979, Appendix R DG Jacket Water Flow (Service Water)	≤ 118 gpm ≤ 185 gpm				
FI-7980, Appendix R DG Aftercooler Water Flow (City Water) FI-7980, Appendix R DG Aftercooler Water Flow (Service Water)	≤ 87 gpm ≤ 137 gpm				

Normal range NOT specified by vendor.

*

** "AS LEFT" minimum following completion of run.

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ATTACHMENT 2 WARNING AND SHUTDOWN FAULT CODES

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FIGURE 3-3. GRAPHICAL DISPLAY AND MENU SELECTION BUTTONS

- Fault codes/messages will be displayed in the **Description Line** of the graphical display. (Refer to Figure 3-3 above)
- The fault codes have been divided into four categories to help determine what corrective action to take for safe operation of the generator set. Use this Attachment to find the category (CTG) and fault description for all codes. Gaps in the code numbers are for codes that do <u>NOT</u> apply to this genset.
- Category A Fault Codes: Pertain to engine or alternator shutdown faults that require immediate repair by qualified service personnel (generator set non-operational). Control prevents the generator set from being restarted.
- Category B Fault Codes: Consist of faults that can affect genset performance or cause engine, alternator, or connected equipment damage. Operate only when generator set is powering critical loads and can<u>NOT</u> be shut down. Requires repair by qualified service personnel.
- Category C Fault Codes: Consist of faults that do <u>NOT</u> affect generator set performance but require qualified service personnel to repair. These codes indicate a defective harness or wiring problem.
- These codes can also indicate a defective engine sensor, leaving no engine protection (Engine damage can occur without detection). Continued operation may void generator set warranty if damage occurs that relates to fault condition.
- Category D Fault Codes: Consist of faults that are repairable by site personnel. Service will be required by qualified service personnel if site personnel can<u>NOT</u> resolve the problem after taking the corrective actions suggested in Attachment 3.
- Category E Fault Codes: Indicates non-critical operational status of generator set, external faults, or customer fault inputs. May require repair by qualified service personnel.

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ATTACHMENT 2 WARNING AND SHUTDOWN FAULT CODES

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CTG	CODE	LAMP	DISPLAYED MESSAGE
Α	111	Shtdn	Internal ECM error
Α	112	Shtdn	Actuator NOT responding
В	113	Wrng	Actuator sensor fault
Α	115	Shtdn	No speed signal
Α	116	Shtdn	Time press sensor high
A	117	Shtdn	Time press sensor low
В	118	Wrng	Pump press sensor high
В	119	Wrng	Pump press sensor low
С	121	Wrng	No engine speed signal
В	122	Wrng	Manifold air press sensor
В	123	Wrng	Manifold air press sensor
С	135	Wrng	Oil pressure sensor
С	141	Wrng	Oil pressure sensor
В	143	Wrng	Low oil pressure
С	144	Wrng	Coolant temperature sensor
С	145	Wrng	Coolant temperature sensor
D	146	Wrng	High coolant temp warning
С	151	Shtdn	High coolant temp alarm
D	152	Wrng	Low coolant temp
С	153	Wrng	Manifold air temp sensor
С	154	Wrng	Manifold air temp sensor
Α	155	Shtdn	Manifold air temp alarm
D	197	Wrng	Coolant level warning
С	212	Wrng	Oil temperature sensor
С	213	Wrng	Oil temperature sensor
A	214	Shtdn	High oil temperature
С	221	Wrng	Air pressure sensor
С	222	Wrng	Air pressure sensor
A	228	Shtdn	Low coolant pressure
С	231	Wrng	Coolant pressure sensor
С	232	Wrng	Coolant pressure sensor
Α	233	Wrng	Coolant pressure waming
A	234	Shtdn	Overspeed
D	235	Shtdn	Coolant level alarm
A	236	Shtdn	Position sensor
D	253	Shtdn	Oil level alarm

CTG	CODE	LAMP	DISPLAYED MESSAGE
А	254	Shtdn	Fuel shutoff valve
С	259	Wrng	Fuel shutoff valve
С	261	Wrng	Fuel temperature sensor
С	263	Wrng	Fuel temperature sensor
С	265	Wrng	Fuel temperature sensor
А	266	Shtdn	Fuel temperature
В	316	Wrng	Fuel supply pump
В	318	Wrng	Fuel supply pump
D	326	Wrng	Oil level warning
В	343	Wrng	Internal ECM error
D	359	Wrng	Engine failed to start
Α	378	Wrng	Fueling actuator #1
Α	379	Wrng	Fueling actuator #1
A	394	Wrng	Fueling actuator #1
Α	395	Wrng	Fueling actuator #1
Α	396	Wrng	Fueling actuator #2
Α	397	Wrng	Fueling actuator #2
Α	398	Wrng	Fueling actuator #2
Α	399	Wrng	Fueling actuator #2
В	415	Shtdn	Low oil pressure alarm
В	421	Wrng	High oil temperature
В	423	Wrng	Fuel timing
D	441	Wrng	Low battery voltage
D	442	Wrng	High battery voltage
В	449	Wrng	High fuel supply pressure
В	451	Wrng	Fuel rail pressure sensor
В	452	Wrng	Fuel rail pressure sensor
А	455	Shtdn	Fuel control valve sensor
В	467	Wrng	Timing rail act sensor
В	468	Wrng	Fuel rail actuator sensor
D	471	Wrng	Low oil level
В	482	Wrng	High fuel supply pressure
В	488	Wrng	High intake manifold temp
С	498	Wrng	Oil level sensor
С	499	Wrng	Oil level sensor
Α	514	Shtdn	Fuel control valve

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ATTACHMENT 2 WARNING AND SHUTDOWN FAULT CODES

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CTG	CODE	LAMP	DISPLAYED MESSAGE		CTG	CODE	LAM
В	546	Wrng	Fuel pressure sensor		Α	1333	Shtdr
В	547	Wrng	Fuel pressure sensor		Α	1334	Shtdr
В	554	Wrng	Fuel rail pressure sensor		В	1335	Wrng
В	555	Wrng	Blowby pressure		E	1336	Shtdr
A	556	Shtdn	Blowby pressure		E	1337	None
A	586	Shtdn	Run/Stop switch		E	1341	Shtdr
A	587	Shtdn	Run/Stop switch		Α	1342	Shtdr
D	611	Wrng	Engine hot		A	1343	Shtdr
D	688	Shtdn	High oil level alarm		Α	1344	Shtdr
В	689	Wrng	Crank shaft sensor		Α	1345	Shtdr
В	719	Wrng	Blowby pressure sensor		Α	1346	Shtdr
B	729	Wrng	Blowby pressure sensor		A	1347	Shtdr
В	778	Wrng	Camshaft sensor		Α	1348	Shtdi
E	1311	Shtdn/ Wrng	Customer input #1		Α	1349	Shtdr
E	1312	Shtdn/ Wrng	Customer input #2		С	1351	Wrng
E	1313	Shtdn Wrng /	Network Fault 1		С	1414	Wrng
E	1314	Shtdn/ Wrng	Network Fault 2		С	1415	Wrng
E	1315	Shtdn/ Wrng	Network Fault 3		D	1416	Wrng
E	1316	Shtdn/ Wrng	Network Fault 4		D	1417	Wrng
E	1317	Shtdn/ Wrng	Customer input #3		В	1419	Wrng
E	1318	Shtdn/ Wrng	Customer input #4		В	1421	Wrng
В	1319	Wrng	High alternator temp		В	1422	Wrng
С	1321	Wrng	Common warning driver		С	1424	Wmg
A	1322	Shtdn	Load gov kW setpoint oor hi		С	1427	Wrng
Α	1323	Shtdn	Load gov kW setpoint oor 10		С	1428	Wrng
В	1324	Wrng	Load gov kVAR oor hi		D	1433	Shtd
В	1325	Wrng	Load gov kVAR oor lo		D	1434	Shtd
В	1326	Wrng	Backup starter disconnect		D	1435	Wrng
A	1327	Shtdn	Load gov kW analog oor		В	1436	Wrng
D	1328	Wrng	Genset CB tripped		Α	1437	Shtdi
В	1329	Wrng	AVR DC power failure		D	1438	Wrng
A	1331	Shtdn	AVR driver shorted		D	1439	Wrng
A	1332	Shtdn	Manual switch oor lo D		1441	Wrng	

······			
CTG	CODE	LAMP	DISPLAYED MESSAGE
Α	1333	Shtdn	Manual switch oor hi
А	1334	Shtdn	Critical scaler oor
В	1335	Wrng	Non critical scaler oor
Е	1336	Shtdn	Cooldown complete
Ε	1337	None	Network wink
E	1341	Shtdn	Load demand stop
Α	1342	Shtdn	Slot 0 card
А	1343	Shtdn	Slot 1 card
Α	1344	Shtdn	Slot 2 card
А	1345	Shtdn	Slot 3 card
А	1346	Shtdn	Slot 4 incorrect
А	1347	Shtdn	Slot 5 card
А	1348	Shtdn	Slot 6 card
Α	1349	Shtdn	Slot 7 card
С	1351	Wrng	Slot 4 / network enabled
С	1414	Wrng	Run relay contact
С	1415	Wrng	Run relay driver
D	1416	Wrng	Fail to shutdown
D	1417	Wrng	Power down error
В	1419	Wrng	Fuel rail driver
В	1421	Wrng	Timing rail driver #1
В	1422	Wrng	Timing rail driver #2
С	1424	Wrng	High side driver
С	1427	Wrng	Overspeed relay driver
С	1428	Wrng	LOP shutdown. relay driver
D	1433	Shtdn	Emergency stop - local
D	1434	Shtdn	Emergency stop - remote
D	1435	Wrng	Engine cold
В	1436	Wrng	PT fuel system drivers
Α	1437	Shtdn	E-stop path fuse blown
D	1438	Wrng	Fail to crank
D	1439	Wrng	Fuel level low in day
D	1441	Wrng	Fuel level low in main

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ATTACHMENT 2 WARNING AND SHUTDOWN FAULT CODES

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CTG	CODE	LAMP	DISPLAYED MESSAGE
D	1442	Wrng	Battery is weak
Α	1443	Wrng	Battery is dead
В	1444	Wrng	kW overload
Α	1445	Shtdn	Alternator short circuit
Α	1446	Shtdn	AC output voltage is high
Α	1447	Shtdn	AC output voltage is low
Α	1448	Shtdn	AC output frequency low
Α	1449	Wrng	AC output frequency high
В	1451	Wrng	Gen/Bus voltage differ
A	1452	Shtdn	Gen CB failed to close
Α	1453	Shtdn	Gen CB failed to open
С	1454	Wrng	Gen CB position contact
Α	1455	Shtdn	Util CB contact
E	1456	Wrng	Bus out of range
E	1457	Wrng	Fail to synchronize
E	1458	Wrng	Phase rotation
Α	1459	Shtdn	Reverse kW
Α	1461	Shtdn	Loss of field
В	1462	Wrng	High ground current
E	1463	None	NOT in Auto
E	1464	None	Load dump
E	1465	None	Ready to load
С	1466	Wrng	Modem failure
С	1467	Wrng	Unable to connect modem
C	1468	Wrng	Network erorr
В	1471	Wrng	High current
A	1472	Shtdn	Overcurrent
			антинания и лининания и на составания и на сост

CTG	CODE	LAMP	DISPLAYED MESSAGE
A	1473	Shtdn	Watchdog failure
A	1474	Shtdn	Software version mismatch
С	1475	Wrng	First start backup
С	1476	Wrng	LonWorks card
С	1477	Wrng	Crank relay contact
С	1478	Wrng	Crank relay driver
Α	1481	Shtdn	AVR driver open
E	1483	None	Common alarm status
A	1485	Shtdn	EFC driver shorted
A	1486	Shtdn	EFC driver open
С	1487	Wrng	Auto acknowledge driver
С	1488	Wrng	Warning LED driver
С	1489	Wrng	Shutdown LED driver
С	1491	Wrng	Ready to load relay driver.
С	1492	Wrng	Load dump relay driver
С	1493	Wrng	Display control driver
С	1494	Wrng	Modem power relay driver
С	1495	Wrng	Common shutdown2 driver
С	1496	Wrng	Auto mode relay driver
С	1497	Wrng	Manual run LED driver
С	1498	Wrng	Exercise run LED driver
С	1499	Wrng	Remote start LED driver
С	2111	Wrng	Aftercooler temp sensor
С	2112	Wrng	Aftercooler temp sensor
В	2113	Wrng	High aftercooler temp
A	2114	Shtdn	High aftercooler temp
			· · · · · · · · · · · · · · · · · · ·
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ATTACHMENT 3 APPENDIX R DG TROUBLESHOOTING PROCEDURES

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WARNING

Many troubleshooting procedures present hazards which can result in severe personal injury or death. Only qualified service personnel with knowledge of fuels, electricity and mechanical hazards should perform service procedures. Review safety precautions

SYMPTOM	CORRECTIVE ACTION
CODE: 146 LAMP: Warning MESSAGE: HIGH COOLANT TEMP WARNING	 Indicates engine has begun to overheat and jacket water coolant temperature has risen to an unacceptable level. If generator is powering non-critical and critical loads and can<u>NOT</u> be shut down, use the following: A. Reduce load if possible by turning off non-critical loads. B. Check air inlets and outlets and remove any obstructions to airflow. C. If engine can be stopped, follow 151 High Coolant Temp Alarm procedure
CODE: 151 LAMP: Shutdown MESSAGE: HIGH COOLANT TEMP ALARM	 Indicates engine has overheated Jacket water coolant temperature has risen above the shutdown trip point or the coolant level is low. Allow engine to cool down completely before proceeding with the following checks: A. Check jacket water coolant level and replenish if low. Look for coolant leakage and repair if necessary. B. Check for obstructions to cooling airflow and correct as necessary. C. Check fan belt and repair if necessary. D. Reset control and restart after locating and correcting problem.

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ATTACHMENT 3 APPENDIX R DG TROUBLESHOOTING PROCEDURES

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SYMPTOM	CORRECTIVE ACTION
CODE: 152 LAMP: Warning MESSAGE: LOW COOLANT TEMP	Indicates engine coolant heater is <u>NOT</u> operating or is <u>NOT</u> circulating coolant. Set is in standby mode but is <u>NOT</u> operating. Warning occurs when engine jacket water coolant temperature is 70° F (21° C) or lower.
	NOTE: In applications where the ambient temperature falls below 40° F (4° C), Low Coolant Temp may be indicated even though the coolant heaters are operating.
	 Check for the following conditions: A. Coolant heater <u>NOT</u> connected to power supply. Check for blown fuse or disconnected heater cord and correct as required. B. Check for low jacket water coolant level and replenish if required. Look for possible coolant leakage points and repair as required.
CODE: 197 LAMP: Warning MESSAGE: COOLANT LEVEL WARNING	Indicates engine jacket water coolant level has fallen to an unacceptable level. If generator is powering critical loads and can <u>NOT</u> be shut down, wait until next shutdown period, then follow 235 Coolant Level Alarm procedure. If engine can be stopped, follow 235 procedure.
CODE: 235 LAMP: Shutdown MESSAGE: COOLANT LEVEL ALARM	Indicates engine jacket water coolant level has fallen below the alarm trip point. Allow engine to cool down completely before proceeding.
	 A. Check jacket water coolant level and replenish if low. Look for possible coolant leakage points and repair if necessary. B. Reset control and restart after locating and correcting problem.
CODE: 253 LAMP: Shutdown MESSAGE: OIL LEVEL ALARM	Indicates engine oil level has dropped below the shutdown trip point. Check oil level, lines and filters. If oil system is OK but oil level is low, replenish. Reset control and restart.

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ATTACHMENT 3 APPENDIX R DG TROUBLESHOOTING PROCEDURES

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SYMPTOM	CORRECTIVE ACTION
CODE: 326 LAMP: Warning MESSAGE: OIL LEVEL WARNING	Indicates that the engine oil level has exceeded the warning trip point for high oil level. If generator is powering critical loads and can <u>NOT</u> be shut down, wait until next shutdown period, then follow 688 High Oil Level Alarm procedure. If engine can be stopped follow 688 procedure.
CODE: 359 LAMP: Warning MESSAGE: ENGINE FAILED TO START	 Indicates possible fault with control or starting system. Check for the following conditions: A. Poor battery cable connections. Clean the battery cable terminals and tighten all connections. B. Discharged or defective battery. Recharge or replace the battery.
CODE: 441 LAMP: Warning MESSAGE: LOW BATTERY VOLTAGE	 Indicates battery voltage is below 24 VDC. A. Discharged or defective battery. Check the battery charger fuse. B. Recharge or replace the battery. Poor battery cable connections. Clean the battery cable terminals and tighten all connections. C. Check engine DC alternator. Replace engine DC alternator if normal battery charging voltage (24 to 26 VDC) is <u>NOT</u> obtained. D. Check float level if applicable (raise float level).
CODE: 442 LAMP: Warning MESSAGE: HIGH BATTERY VOLTAGE	Indicates battery voltage exceeds 32 VDC. Check float level on battery charger if applicable (lower float level). Check engine DC alternator. Replace engine DC alternator if normal battery charging voltage (24 to 26 VDC) is <u>NOT</u> obtained.

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ATTACHMENT 3

APPENDIX R DG TROUBLESHOOTING PROCEDURES

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SYMPTOM	CORRECTIVE ACTION		
CODE: 471 LAMP: Warning MESSAGE: LOW OIL LEVEL	Indicates engine oil has dropped to an unacceptable level. If generator is powering critical loads and can <u>NOT</u> be shut down, wait until next shutdown period, then follow 253 Oil level Alarm procedure. If engine can be stopped follow 253 procedure.		
CODE: 611 LAMP: Warning MESSAGE: ENGINE HOT	Indicates that an engine hot shut down has occurred (cooldown timers were bypassed). This condition will occur when the engine coolant temperature is above the normal operating level and the operator presses the Emergency Switch or moves the O/Manual/Auto switch to the 0 (Off) position. This type of shutdown should be avoided. Can cause possible loss of performance and engine damage.		
CODE: 688 LAMP: Shutdown MESSAGE: HIGH OIL LEVEL ALARM	Indicates that the engine oil level has exceeded the alarm trip point for high oil level. Check oil level. Drain oil to operating level.		
CODE: 1311 through 1318 LAMP: Shutdown/Warning MESSAGE: Customer Defined Fault	When anyone of these customer defined inputs is detected by the control, the corresponding fault message is displayed. The nature of the fault is an optional customer selection. These fault functions can be programmed to initiate a shutdown or warning as indicated by the Warning or Shutdown lamp. Note: Customer fault messages are editable. The message displayed for the code shown (1311 through 1318) is determined by the customer.		
CODE: 1416 LAMP: Warning MESSAGE: FAIL TO SHUTDOWN	Status - indicates that the "Fault Bypass" mode is enabled. This mode is primarily used by service personnel for troubleshooting purposes. In this mode the generator set ignores the majority of system shutdown faults.		
CODE: 1417 LAMP: Warning MESSAGE: POWER DOWN ERROR	Indicates that the control can <u>NOT</u> power down due to some unknown condition. Possible drain on battery. Contact an authorized service center for service.		
CODE: 1433/1434 LAMP: Shutdown MESSAGE: EMERGENCY STOP - LOCAL / EMERGENCY STOP - REMOTE	Indicates local or remote Emergency Stop. Emergency Stop shutdown status can be reset only at the local control panel. To reset the local/remote Emergency Stop button: Pull the button out. Move the O/Manual/Auto switch to 0 (off). Press the front panel Fault Acknowledge button. Select Manual or Auto, as required.		

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ATTACHMENT 3 APPENDIX R DG TROUBLESHOOTING PROCEDURES

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SYMPTOM	CORRECTIVE ACTION
CODE: 1438 LAMP: Warning MESSAGE: FAIL TO CRANK	 Indicates possible fault with control or starting system. Check for the following conditions: A. Poor battery cable connections. Clean the battery cable terminals and tighten all connections. B. Discharged or defective battery. Recharge or replace the battery.
CODE: 1439 LAMP: Warning MESSAGE: FUEL LEVEL LOW IN DAY	Indicates fuel supply is running low. Check fuel supply and replenish as required.
CODE: 1441 LAMP: Warning MESSAGE: FUEL LEVEL LOW IN MAIN	Indicates fuel supply is running low. Check fuel supply and replenish as required.
CODE: 1442 LAMP: Warning MESSAGE: BATTERY IS WEAK	Indicates battery voltage drops below 14.4 volts for two seconds, during starting. Discharged or defective battery. See Warning message 441 Low Battery Voltage .
CODE: 1443 LAMP: Warning MESSAGE: BATTERY IS DEAD	Indicates battery has dropped below genset operating range (3.5 volts when cranking) to power the starter and the control circuitry. See Warning message 441 Low Battery Voltage .