



Nuclear Northeast



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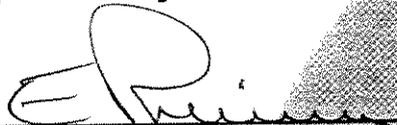
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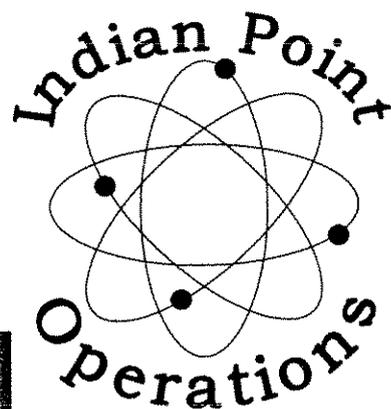
UNIT 2 APPENDIX R DIESEL GENERATOR OPERATION

Approved By:

 161308

Procedure Sponsor, DM/Designee

Date



Team 2A

Procedure Owner

PARTIAL REVISION

REVISION SUMMARY

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1.0 REASONS FOR REVISION

1.1 Editorial revision to correct sequence numbering of Attachment 4.

2.0 SUMMARY OF CHANGES

- 2.1 Added Steps 4.1.2.4, 4.3.3.4, 4.5.2.4, and 4.7.1.4 to ENSURE 3 damper set directly west of Appendix R DG are Open (Turbine Building West Wall, above MCC-10V) per EC 33794. (CR-IP2-2008-02938, CA2)
- 2.2 Changed NOTE prior to Step 4.3.30 to indicate Service Water Cooling must be initiated within 2 hours per EC 33794. (CR-IP2-2008-02938, CA2)
- 2.3 Changed Step 4.3.32 to require the Appendix R DG be transferred to Service Water Cooling within 2 hours per EC 33794. (CR-IP2-2008-02938, CA2)
- 2.4 Corrected typographical errors associated with sequence numbering throughout Attachment 4. **(Editorial, 4.6.13)**
- 2.5 Added location, 480 Volt Room, to Steps 1.2.3.4, 1.2.4.4, 1.3.3.4, and 1.3.4.4. **(Editorial 4.6.9)**

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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 IF this is an engine start supplying Unit 2 Appendix R Loads THEN GO TO Step 4.3, Engine Start Supplying Unit 2 Appendix R Loads. All applicable prerequisites are included in that section.
- 2.2 IF this is an engine start during a Loss of all AC Power THEN GOTO Step 4.5,

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Engine Start (Loss Of AC Power/ SBO). All applicable prerequisites are included in that section.

- 2.3** IF this is an engine start supplying Unit 3 Appendix R Loads THEN GOTO Step, 1.1.

- 2.4 Engine Start (Supply Unit 3 SBO / ASS Loads. All applicable prerequisites are included in that section.
- 2.5 TRO 3.8.B applies in Modes 1, 2, 3 and 4.
- 2.6 The Appendix R Diesel Generator maximum continuous load is 2045 kW. During an emergency, maximum generator load is 2700 kW for 25 hours/yr.
- 2.7 Do NOT 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 or running with engine coolant temperature too low, below 140°F will dilute crank case oil with raw fuel.
- 2.8 Whenever the Appendix R Diesel Generator is running log readings SHALL be established. Log readings should be taken once an hour.
- 2.9 Crankcase oil level should only be checked at the lube oil reservoir gage glass when the engine is running. Removing the engine oil fill cap or dipstick can allow hot oil to splash out.
- 2.10 Pushing the Emergency Stop button OR placing the 0/Manual/Auto switch to the 0 position will cause an immediate engine shutdown (bypassing the cool-down at idle). This hot shutdown should be avoided, if possible, to prolong reliability of engine.
- 2.11 When a warning alarm comes in it can not be reset until the machine is shutdown. The only way to reset the alarm is to take the 0/Manual/Auto switch to the 0 position which would shutdown the engine without a cool-down.

3.0 PREREQUISITES

- _____ 3.1 The Appendix R Diesel Generator (DG) is aligned per 2-COL-27.6, Unit 2 Appendix R Diesel Generator.
- _____ 3.2 Lube Oil Supply Reservoir gauge glass level indicates between 8 gallons and 29 gallons.
- _____ 3.3 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
- _____ 3.4 The Appendix R Diesel Generator Fuel Day Tank Level Gauge indicates between 7/8 and FULL.

NOTE

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

- _____ 3.5 The following coolant surge tank levels are within range:
- _____ • Jacket Water Surge Tank level between 1/4 and 1/2 full (cold level)
 - _____ • After Cooler Surge Tank level between 1/4 and 1/2 full (cold level)
- _____ 3.6 The Appendix R DG Auxiliary Transfer Switch is aligned to MCC 22 as follows:
(Appendix R DG Auxiliaries MCC)
- _____ 3.6.1 Source 1 Available (White Light Illuminated)
 - _____ 3.6.2 Source 1 Connected (Green Light Illuminated)

4.0 PROCEDURE

4.1 Normal Engine Start (Parallel Mode)

- _____ 4.1.1 REQUEST the CCR to notify the SO that the Appendix R Diesel will be paralleled to 13W93.

NOTE

- 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

- _____ 4.1.2 PERFORM the following as necessary to prevent exceeding design maximum temperatures:
- _____ 4.1.2.1 ENSURE the Delay Gate is Closed
 - _____ 4.1.2.2 IF the Tool Room Roll-up door will be opened, THEN REQUEST permission from the CCR to open the Tool Room Roll-up door.
 - _____ 4.1.2.3 ENSURE one of the following is Open:
 - _____ • The Maintenance Loading Bay overhead door (15' Elevation)
 - _____ • Tool Room Roll-up door (15 'Elevation)
 - _____ 4.1.2.4 ENSURE 3 damper set directly west of Appendix R DG is Open (Turbine Building West Wall, above MCC-10V)
- _____ 4.1.3 ENSURE the following Appendix R Diesel Generator Fuel Oil Day Tank Indications are Illuminated:
- _____ • System Ready Yellow LED flashing
 - _____ • Power Available Green LED illuminated

- _____ 4.1.4 PERFORM the following at the Appendix R DG Day Tank Control Panel:
 - _____ 4.1.4.1 PRESS the System Test switch
 - _____ a) CHECK all LEDs on the control panel are illuminated
 - _____ b) RELEASE the System Test switch
 - _____ 4.1.4.2 PRESS the Alarm Test switch to test the alarm level and pump fail functions.
 - _____ a) RELEASE the Alarm Test switch
 - _____ 4.1.4.3 CHECK NO abnormal condition exists as indicated by a LED in a flashing ON state and horn sounding.
 - _____ a) IF at any time an abnormal condition is sensed:
 - _____ 1) PRESS the Alarm Silence button to silence the alarm horn.
 - _____ 2) WHEN the abnormal condition is corrected, THEN the alarming LED is turned OFF automatically.
- _____ 4.1.5 ENSURE that breaker SBOH (SBO/APP. R Switchgear 13.8KV Bus) is OPEN. (SBO/APP. R Switchgear 13.8KV Bus)
- _____ 4.1.6 ENSURE that breaker SBO/ASS is OPEN. (SBO/APP R Diesel Generator Switchgear)
- _____ 4.1.7 PLACE the UNIT-PARALLEL switch in PARALLEL. (SBO/ APP R Switchgear 13.8 KV Bus)
- _____ 4.1.8 CLOSE Breaker ASS. (SBO/APP. R Switchgear 13.8KV Bus)
- _____ 4.1.9 ENSURE the following at the Appendix R DG Switch Panel (Control Panel):
 - _____ 4.1.9.1 Shutdown Status indicator – Extinguished
 - _____ 4.1.9.2 Warning Status indicator – Extinguished
- _____ 4.1.10 At the Appendix R DG Switch Panel (Control Panel) PRESS and HOLD the Panel Lamp/Lamp Test button for at least 3 Seconds
 - _____ 4.1.10.1 CHECK all control panel LEDs illuminate
 - _____ 4.1.10.2 RELEASE Panel Lamp/Lamp Test button

CAUTION

When Service Water is aligned to supply cooling to the Appendix R DG Heat Exchangers, placing Service Water in service slowly ensures flow will NOT adversely affect the operation of the conventional Service Water header.

_____ 4.1.11 IF Service Water will be the cooling source, THEN ALIGN Service Water to The Appendix R DG as follows:

_____ 4.1.11.1 OPEN SWT-837

_____ 4.1.11.2 ADJUST Cooling Water flow as follows:

_____ a) THROTTLE UW-840 to achieve approximately 140 gpm as indicated by FI-7980, Aftercooler Water Flow.

_____ b) THROTTLE UW-836 to achieve approximately 160 gpm as indicated by FI-7979, Jacket Water Flow.

_____ 4.1.12 IF City Water will be the cooling source, THEN ALIGN City Water to The Appendix R DG as follows:

_____ 4.1.12.1 OPEN the following:

_____ a) UW-854

_____ b) UW-855

_____ 4.1.12.2 ADJUST Cooling Water flow as follows:

_____ a) THROTTLE UW-840 to achieve approximately 90 gpm as indicated by FI-7980, Aftercooler Water Flow.

_____ b) THROTTLE UW-836 to achieve approximately 120 gpm as indicated by FI-7979, Jacket Water Flow.

NOTE

- 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 OR the warm-up at idle time is completed, the generator will ramp up to rated speed and voltage.

_____ 4.1.13 TURN the 0/MANUAL/AUTO switch to the MANUAL position.

_____ 4.1.14 PRESS AND HOLD the Manual Run/Stop button for a minimum of 3 seconds

_____ 4.1.14.1 RELEASE the Manual Run/Stop button.

NOTE

- The \ 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 OR generator synchronized with bus).

_____ 4.1.15 CLOSE breaker SBO/ASS as follows:

_____ 4.1.15.1 PRESS AND HOLD the \ momentary pushbutton until the symbol indicates - (breaker SBO/ASS closed).

_____ 4.1.15.2 RELEASE the momentary pushbutton.

NOTE

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

_____ 4.1.16 IF a Warning Condition occurs (Warning Status Indicator illuminates yellow), THEN PERFORM the following:

_____ 4.1.16.1 IF the Alarm Module warning horn annunciated, THEN momentarily PUSH the PUSH TO SILENCE HORN button.

_____ 4.1.16.2 REFER to the following for assistance in correcting the condition:

- _____ • ATTACHMENT 2, WARNING AND SHUTDOWN FAULT CODES
- _____ • ATTACHMENT 3, APPENDIX R DG TROUBLESHOOTING PROCEDURES

NOTE

A warning condition can not be reset until the engine is shutdown.

_____ 4.1.16.3 WHEN the condition is corrected, THEN the Warning Status Indicator may be reset as follows:

- _____ a) PRESS the front panel FAULT ACKNOWLEDGE button

NOTE

If a shutdown condition occurs the Shutdown Status Indicator will illuminate red and the engine will shutdown immediately or on a cool-down timer at any time an abnormal condition is sensed:

- _____ 4.1.17 IF a shutdown condition occurs (Shutdown Status Indicator illuminates red), THEN PERFORM the following:
 - _____ 4.1.17.1 IF the Alarm Module warning horn annunciated, THEN momentarily PUSH the PUSH TO SILENCE HORN button.
 - _____ 4.1.17.2 REFER to the following for assistance in correcting the condition:
 - _____ • ATTACHMENT 2, WARNING AND SHUTDOWN FAULT CODES
 - _____ • ATTACHMENT 3, APPENDIX R DG TROUBLESHOOTING PROCEDURES
 - _____ 4.1.17.3 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
 - _____ c) PRESS the front panel FAULT ACKNOWLEDGE button
 - _____ d) PLACE the 0/MANUAL/AUTO switch in AUTO
- _____ 4.1.18 IF desired to ALIGN the Appendix R DG Auxiliaries MCC to the Appendix R DG THEN PERFORM the following:
 - _____ 4.1.18.1 CHECK the Appendix R DG Auxiliary Transfer Switch is aligned as follows:
 - _____ a) Source 2 Available (Yellow Light illuminated)

_____ 4.1.18.2 ROTATE and HOLD 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) WHEN the CHECK Source 2 Connected (Red Light) illuminates, THEN RELEASE the switch

_____ 4.1.19 CHECK that the DG Area Fan is running

_____ 4.1.20 ADJUST cooling water throttle valves to maintain normal cooling temperatures.

_____ • UW-836

_____ • UW-840

NOTE

One set of data should be taken, even if engine is operated for less than an hour.

_____ 4.1.21 RECORD Appendix R DG parameters once per hour using ATTACHMENT 1, APPENDIX R DG DATA SHEETS.

NOTE

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

_____ 4.1.22 MONITOR Appendix R DG Day Tank Level.

_____ 4.1.23 MONITOR Lube Oil Supply Reservoir gauge glass level.

_____ 4.1.23.1 WHEN gauge glass level indicates less than 8 gallons, THEN REFILL Lube Oil Supply Reservoir with proper grade of oil. (SAE 15W – 40 Class A)

_____ 4.1.24 CHECK the engine systems for leakage

_____ 4.1.24.1 IF leakage is observed, THEN INITIATE a WRT as necessary:

- _____ 4.1.25 IF it is desired to adjust diesel generator load,
THEN PERFORM the following:
 - _____ 4.1.25.1 SELECT Base Load using the arrow key from the UTILITY Menu.
 - _____ 4.1.25.2 ADJUST load as desired using the "+" or "-" keys.
- _____ 4.1.26 IF it is desired to adjust diesel generator VARs,
THEN PERFORM the following:
 - _____ 4.1.26.1 SELECT PF LEVEL using the arrow key from the UTILITY Menu.
 - _____ 4.1.26.2 ADJUST VARs as desired using the "+" or "-" keys.

4.2 Normal Engine Shutdown (Parallel Mode)

- _____ 4.2.1 REQUEST the CCR to notify the SO that the Appendix R DG will be unloaded.
- _____ 4.2.2 IF Appendix R DG Auxiliaries are aligned to the DG, THEN ALIGN the Appendix R DG Auxiliaries MCC to MCC 22 as follows:
- _____ 4.2.2.1 CHECK the Appendix R DG Auxiliary Transfer Switch is aligned as follows:
- _____ a) Source 1 Available (White Light illuminated)
- _____ 4.2.2.2 ROTATE and HOLD the Appendix R DG Auxiliaries Normal/Standby Switch in the STANDBY position (Aligned to MCC 22) (Appendix R DG Auxiliaries MCC)
- _____ a) WHEN the CHECK Source 1 Connected (Green Light) illuminates, THEN RELEASE the switch

NOTE

- The preset cool-down time (at rated speed) will vary dependent on the kW output.
- The generator will stop after the cool-down at idle time is expended.

- _____ 4.2.3 PRESS AND RELEASE the Manual Run/Stop button.
- _____ 4.2.3.1 VERIFY engine rotation has stopped.
- _____ 4.2.3.2 ENSURE breaker SBO/ASS is Open and verify it's closing springs are charged. (SBO/APP R Diesel Generator Switchgear)
- _____ 4.2.3.3 OPEN breaker ASS and verify the closing springs are charged. (SBO/APP. R Switchgear 13.8KV Bus)
- _____ 4.2.3.4 PLACE the UNIT/PARALLEL switch in UNIT. (SBO/APP R Switchgear 13.8KV Bus)

- _____ 4.2.3.5 IF the Appendix R DG Heat Exchangers are aligned to Service Water, THEN ALIGN the Appendix R DG Heat Exchangers to City Water as follows:
- _____ a) CLOSE SWT-837 to secure Service Water flow.
 - _____ b) OPEN the following:
 - _____ 1) UW-854
 - _____ 2) UW-855
 - _____ c) ADJUST Cooling Water flow as follows:
 - _____ 1) 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.
- _____ 4.2.3.6 ENSURE the following are Closed to secure City Water to the APPENDIX R DG Heat Exchangers:
- _____ a) UW-854
 - _____ b) UW-855
- _____ 4.2.3.7 ENSURE the door opened in Step 4.1.2.3 is CLOSED.
- _____ 4.2.4 ENSURE the Lube Oil Supply Reservoir is refilled with the proper grade of oil. (SAE 15W – 40 Class A)
- _____ 4.2.5 TURN the 0/MANUAL/AUTO switch to the AUTO position.

4.3 Engine Start Supplying Unit 2 Appendix R Loads

NOTE

- This section is written for emergency operation. If one of the steps can NOT be met the Supervisor in charge must evaluate continued action.
- If DC control power is not available for breaker operation, breakers may be operated manually using Section 4.9, Manual Breaker and Transfer Switch Operation.
- The starting of the appendix R diesel should not be delayed. Requests for opening breakers F3-1 and 52GT/2F should be made by other personnel if possible.
- SO Phone Number: (212) 580-6789
- DO Phone Number: (212) 580-6754

_____ 4.3.1 INITIATE having the District Operator (DO) Open breaker F3-1.

_____ 4.3.1.1 REQUEST Notification from DO as soon as breaker F3-1 has been opened.

_____ 4.3.2 INITIATE having the Unit 3 CCR Open breaker 52GT/2F.

_____ 4.3.2.1 Request Notification from Unit 3 CCR as soon as breaker 52GT/2F has been opened.

NOTE

- 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

_____ 4.3.3 PERFORM the following as necessary to prevent exceeding design maximum temperatures:

_____ 4.3.3.1 ENSURE the Delay Gate is Closed

- _____ 4.3.3.2 IF the Tool Room Roll-up door will be opened, THEN REQUEST permission from the CCR to open the Tool Room Roll-up door.
- _____ 4.3.3.3 ENSURE one of the following is Open:
- _____ • The Maintenance Loading Bay overhead door (15' Elevation)
 - _____ • Tool Room Roll-up door (15 'Elevation)
- _____ 4.3.3.4 ENSURE 3 damper set directly west of Appendix R DG is Open (Turbine Building West Wall, above MCC-10V)
- _____ 4.3.4 ENSURE the following Appendix R Diesel Generator Fuel Oil Day Tank Indications are Illuminated:
- _____ • System Ready Yellow LED flashing
 - _____ • Power Available Green LED illuminated
- _____ 4.3.5 PERFORM the following at the Appendix R DG Day Tank Control Panel:
- _____ 4.3.5.1 CHECK NO abnormal condition exists as indicated by a LED in a flashing ON state and horn sounding.
- _____ a) IF at any time an abnormal condition is sensed:
 - _____ 1) PRESS the Alarm Silence button to silence the alarm horn.
 - _____ 2) WHEN the abnormal condition is corrected, THEN the alarming LED is turned OFF automatically.
- _____ 4.3.6 ENSURE that breaker SBOH is OPEN. (SBO/APP. R Switchgear 13.8KV Bus)
- _____ 4.3.7 ENSURE that breaker SBO/ASS is OPEN. (SBO/APP R Diesel Generator Switchgear)
- _____ 4.3.8 CLOSE Breaker ASS. (SBO/APP. R Switchgear 13.8KV Bus)
- _____ 4.3.9 PLACE the UNIT-PARALLEL switch in UNIT. (SBO/ APP R Switchgear 6.9KV Bus)

- ___ 4.3.10 ENSURE the following at the Appendix R DG Switch Panel (Control Panel):
 - ___ 4.3.10.1 Shutdown Status indicator – Extinguished
 - ___ 4.3.10.2 Warning Status indicator – Extinguished
- ___ 4.3.11 IF City Water will be the cooling source, THEN ALIGN City Water to The Appendix R DG as follows:
 - ___ 4.3.11.1 OPEN the following:
 - ___ a) UW-854
 - ___ b) UW-855

NOTE

Maintaining the City Water flows specified ensures that adequate volume in the City Water Storage Tank is reserved for other plant activities.

- ___ 4.3.11.2 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.
- ___ 4.3.12 IF Conventional Service Water is available AND the CRS gives permission to use it as the cooling source, THEN ALIGN Conventional Service Water to The Appendix R DG as follows:
 - ___ 4.3.12.1 OPEN SWT-837
 - ___ 4.3.12.2 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 160 gpm as indicated by FI-7979, Jacket Water Flow.

_____ 4.3.13 ENSURE the following breakers are OPEN:

_____ 4.3.13.1 F3-1

_____ 4.3.13.2 52GT/2F

_____ 4.3.13.3 SB1-3

NOTE

If GT-2 is out of service, the position of output breaker BGT-2 does NOT need to be verified locally. The normal COL position of breaker BGT-2 is Open.

_____ 4.3.14 ENSURE that GT-2 is out of service.

_____ 4.3.15 ENSURE breaker B3-3 is Closed.

NOTE

- 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 OR the warm-up at idle time is completed, the generator will ramp up to rated speed and voltage.
- The Appendix R Diesel Generator's maximum continuous load is 2045 kW. During an emergency, maximum generator load is 2700 kW for 25 hours/yr.
- When starting equipment, coordination with the CRS will be necessary to ensure adequate generator capacity is available.

_____ 4.3.16 TURN the 0/MANUAL/AUTO switch to the MANUAL position.

_____ 4.3.17 PRESS AND HOLD the Manual Run/Stop button for a minimum of 3 seconds

_____ 4.3.17.1 RELEASE the Manual Run/Stop button.

NOTE

- The _ _ 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 OR generator synchronized with bus).

_____ 4.3.18 CLOSE breaker SBO/ASS as follows:

_____ 4.3.18.1 PRESS AND HOLD the _ _ momentary pushbutton until the symbol indicates _ -_ (breaker SBO/ASS closed).

NOTE

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

_____ 4.3.19 IF a Warning Condition occurs (Warning Status Indicator illuminates yellow), THEN PERFORM the following:

_____ 4.3.19.1 IF the Alarm Module warning horn annunciated, THEN momentarily PUSH the PUSH TO SILENCE HORN button.

_____ 4.3.19.2 REFER to the following for assistance in correcting the condition:

- _____ • ATTACHMENT 2, WARNING AND SHUTDOWN FAULT CODES
- _____ • ATTACHMENT 3, APPENDIX R DG TROUBLESHOOTING PROCEDURES

NOTE

A warning condition can not be reset until the engine is shutdown.

_____ 4.3.19.3 WHEN the condition is corrected, THEN the Warning Status Indicator may be reset as follows:

- _____ a) PRESS the front panel FAULT ACKNOWLEDGE button

NOTE

If a shutdown condition occurs the Shutdown Status Indicator will illuminate red and the engine will shutdown immediately or on a cool-down timer at any time an abnormal condition is sensed:

_____ 4.3.20 IF a shutdown condition occurs (Shutdown Status Indicator illuminates red), THEN PERFORM the following:

_____ 4.3.20.1 IF the Alarm Module warning horn annunciated, THEN momentarily PUSH the PUSH TO SILENCE HORN button.

_____ 4.3.20.2 REFER to the following for assistance in correcting the condition:

- _____ • ATTACHMENT 2, WARNING AND SHUTDOWN FAULT CODES
- _____ • ATTACHMENT 3, APPENDIX R DG TROUBLESHOOTING PROCEDURES

_____ 4.3.20.3 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
- _____ c) PRESS the front panel FAULT ACKNOWLEDGE button
- _____ d) PLACE the 0/MANUAL/AUTO switch in AUTO

_____ 4.3.21 IF desired to ALIGN the Appendix R DG Auxiliaries MCC to the Appendix R DG THEN PERFORM the following:

_____ 4.3.21.1 CHECK the Appendix R DG Auxiliary Transfer Switch is aligned as follows:

_____ a) Source 2 Available (Yellow Light illuminated)

_____ 4.3.21.2 ROTATE and HOLD 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) WHEN the CHECK Source 2 Connected (Red Light) illuminates, THEN RELEASE the switch

_____ 4.3.22 CHECK that the DG Area Fan is running

_____ 4.3.23 ENSURE that breaker SBO/ASS is Closed. (SBO/APP R Diesel Generator Switchgear)

_____ 4.3.24 ADJUST cooling water throttle valves to maintain normal cooling temperatures.

_____ • UW-836

_____ • UW-840

_____ 4.3.25 IF desired to reduce load then OPEN:

_____ 4.3.25.1 All Unnecessary Substation 13SA3 Loads

_____ 4.3.25.2 All Unnecessary Substation 12RW3 Loads

_____ 4.3.25.3 All Substation 102NS3 Loads

_____ 4.3.25.4 TR-2 Main Supply Breaker to TSC Bus Section #2.

NOTE

One set of data should be taken, even if engine is operated for less than an hour.

_____ 4.3.26 IF time permits, THEN RECORD Appendix R DG parameters once per hour using ATTACHMENT 1, APPENDIX R DG DATA SHEETS.

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.

- _____ 4.3.27 MONITOR Appendix R DG Day Tank Level.
- _____ 4.3.28 MONITOR Lube Oil Supply Reservoir gauge glass level.
 - _____ 4.3.28.1 WHEN gauge glass level indicates less than 8 gallons full, THEN REFILL Lube Oil Supply Reservoir with proper grade of oil. (SAE 15W – 40 Class A)
- _____ 4.3.29 CHECK the engine systems for leakage
 - _____ 4.3.29.1 IF leakage is observed, THEN INITIATE a WRT as necessary:

NOTE

- For an Appendix R event, the City Water Storage Tank will provide the cooling water for up to the first 2 hours of the event.
- Once a Service Water Pump is running and within 2 hours of initiating cooling to the Appendix R DG, cooling must be transferred to the Service Water System.

- _____ 4.3.30 COORDINATE with the CRS to place a Service Water pump in service.

NOTE

- When reducing service water loads on the Conventional Service Water header, coordination with the CRS will be necessary. If a River Water Pump is in service, then as a minimum SWT-636 should be closed.

- _____ 4.3.31 PERFORM the following in preparation for transferring DG cooling to the Service Water System:
 - _____ 4.3.31.1 IF a River Water Pump is NOT in service, THEN CLOSE SWT-636 (River Water/Service Water Tie)

- _____ 4.3.31.2 CLOSE the following as necessary to reduce Service Water loads based on CRS evaluation of Service Water Pumps and River Water Pumps in service.
- _____ • SWT-618 (CVP 22 Seal Water Heat Exchanger SW Inlet Stop)
 - _____ • SWT-619 (CVP 21 Seal Water Heat Exchanger SW Inlet Stop)
 - _____ • SWT-23 (PCV-1180 Inlet Stop)
 - _____ • SWT-24 (PCV-1180 Bypass Stop)
 - _____ • SWT-658 (Degassing Pumps Service Water Inlet Stop)
 - _____ • SWT-685 (Stator Water Cooler B Inlet Stop)
 - _____ • SWT-688 (Stator Water Cooler A Inlet Stop)
 - _____ • SWT-18 (21 Turb Hall Closed Cooling Sys Hx Svc Wtr Inlet Stop)
 - _____ • SWT-18-1 (22 THCCHx Service Water Inlet Stop)
 - _____ • SWT-816 (Isol Valve For Cooling Water To HPFW Sample Coolers)
 - _____ • SWT-634 (Main Lube Oil Coolers Service Water Inlet Stop)
 - _____ • SWN-4 (Screen Wash And Bearing Cooling Hdr Supply From SWP 21-23 Disc)
 - _____ • SWN-5 (Screen Wash And Bearing Cooling Hdr Supply From SWP 24,25,26)
- _____ 4.3.31.3 CLOSE the following for non-running Service Water Pumps as necessary to reduce Service Water loads based on CRS evaluation of Service Water Pumps and River Water Pumps in service:
- _____ • SWN-600 (21 SWP Strainer Blowdown Stop Valve)
 - _____ • SWN-598 (22 SWP Strainer Blowdown Stop Valve)
 - _____ • SWN-596 (23 SWP Strainer Blowdown Stop Valve)
 - _____ • SWN-594 (24 SWP Strainer Blowdown Stop Valve)
 - _____ • SWN-592 (25 SWP Strainer Blowdown Stop Valve)
 - _____ • SWN-590 (26 SWP Strainer Blowdown Stop Valve)

- _____ 4.3.32 WHEN a Service Water Pump is in service AND within 2 hours of initiating cooling to the Appendix R DG, ALIGN Service Water to the Appendix R DG as follows:
 - _____ 4.3.32.1 IF aligning to the 1,2,3 Header, THEN OPEN FCV-1112 (SWP 21/22/23 Sup To Conv Non Essen Stop)
 - _____ 4.3.32.2 IF aligning to the 4,5,6 Header, THEN OPEN FCV-1111 (SWP 24/25/26 Sup To Conv Non Essen Stop)
 - _____ 4.3.32.3 OPEN SWT-837
- _____ 4.3.33 ADJUST Service Water flow as follows:
 - _____ 4.3.33.1 THROTTLE UW-840 to achieve approximately 137 gpm as indicated by FI-7980, Aftercooler Water Flow.
 - _____ 4.3.33.2 THROTTLE UW-836 to achieve approximately 160 gpm as indicated by FI-7979, Jacket Water Flow.
- _____ 4.3.34 ENSURE City Water Cooling to the APPENDIX R DG Heat Exchangers is secure by CLOSING:
 - _____ 4.3.34.1 UW-854
 - _____ 4.3.34.2 UW-855

4.4 Engine Shutdown From Supplying Unit 2 Appendix R Loads

_____ 4.4.1 IF Appendix R DG Auxiliaries are aligned to the DG, THEN ALIGN the Appendix R DG Auxiliaries MCC to MCC 22 as follows:

_____ 4.4.1.1 CHECK the Appendix R DG Auxiliary Transfer Switch is aligned as follows:

_____ a) Source 1 Available (White Light illuminated)

_____ 4.4.1.2 PLACE the Appendix R DG Normal/ Standby Switch in the STANDBY position (Aligned to MCC 22) (Appendix R DG Auxiliaries MCC)

_____ a) WHEN the CHECK Source 1 Connected (Green Light) illuminates, THEN RELEASE the switch

NOTE

- When restoring to a normal electrical lineup no paralleling capability exists.
- The following steps will de-energize L&P 13.8KV Bus 3. Coordination with the CRS will be necessary.

_____ 4.4.2 MINIMIZE the load on the Appendix R DG to between 300 and 400 kW.

_____ 4.4.3 OPEN breaker ASS (SBO/APP. R Switchgear 13.8KV Bus)

_____ 4.4.4 IF L&P Bus 3 will be aligned to the SYN Bus, THEN REQUEST the CRS to perform the following:

_____ 4.4.4.1 OPEN breaker B3-3.

_____ 4.4.4.2 CLOSE breaker SB1-3.

_____ 4.4.5 IF restoration of 13W93 is required, THEN REQUEST the CRS to coordinate with the DO and Unit 3 to perform the following:

_____ 4.4.5.1 CLOSE F3-1

_____ 4.4.5.2 CLOSE 52GT/2F

_____ 4.4.6 ENSURE breaker SBO/ASS is Open. (SBO/APP R Diesel Generator Switchgear)

- _____ 4.4.7 PRESS AND RELEASE the Manual Run/Stop button.
 - _____ 4.4.7.1 VERIFY engine rotation has stopped.
 - _____ 4.4.7.2 ENSURE breaker SBO/ASS is Open. (SBO/APP R Diesel Generator Switchgear)
- _____ 4.4.8 PLACE the UNIT/PARALLEL switch in UNIT. (SBO/APP R Switchgear 13.8KV Bus)
- _____ 4.4.9 IF the Appendix R DG Heat Exchangers are aligned to Service Water, THEN ALIGN the Appendix R DG Heat Exchangers to City Water as follows:
 - _____ 4.4.9.1 CLOSE SWT-837 to secure Service Water flow.
 - _____ 4.4.9.2 OPEN the following:
 - _____ a) UW-854
 - _____ b) UW-855
 - _____ 4.4.9.3 ADJUST Cooling Water flow as follows:
 - _____ a) THROTTLE UW-840 to achieve approximately 100 gpm as indicated by FI-7980, Aftercooler Water Flow.
 - _____ b) THROTTLE UW-836 to achieve approximately 100 gpm as indicated by FI-7979, Jacket Water Flow.
 - _____ 4.4.9.4 WAIT a minimum of 5 minutes for City Water to flush residual Service Water from the Appendix R DG Heat Exchangers and piping.
- _____ 4.4.10 ENSURE the following are Closed to secure City Water to the APPENDIX R DG Heat Exchangers:
 - _____ 4.4.10.1 UW-854
 - _____ 4.4.10.2 UW-855
- _____ 4.4.11 Restore Electrical loads previously isolated for the Following:
 - _____ 4.4.11.1 Substation 13SA3
 - _____ 4.4.11.2 Substation 12RW3
 - _____ 4.4.11.3 Substation 102NS3

4.4.11.4 TR-2 Main Supply Breaker to TSC Bus Section #2

4.4.12 COORDINATE with the CCR to place the following valves in the position appropriate for the plant condition:

- SWT-636 (River Water/Service Water Tie)
- SWT-618 (CVP 22 Seal Water Heat Exchanger SW Inlet Stop)
- SWT-619 (CVP 21 Seal Water Heat Exchanger SW Inlet Stop)
- SWT-23 (PCV-1180 Inlet Stop)
- SWT-24 (PCV-1180 Bypass Stop)
- SWT-658 (Degassing Pumps Service Water Inlet Stop)
- SWT-685 (Stator Water Cooler B Inlet Stop)
- SWT-688 (Stator Water Cooler A Inlet Stop)
- SWT-18 (21 Turb Hall Closed Cooling Sys Hx Svc Wtr Inlet Stop)
- SWT-18-1 (22 THCHx Service Water Inlet Stop)
- SWT-816 (Isol Valve For Cooling Water To HPFW Sample Coolers)
- SWT-634 (Main Lube Oil Coolers Service Water Inlet Stop)
- SWN-4 (Screen Wash And Bearing Cooling Hdr Supply From SWP 21-23 Disc)
- SWN-5 (Screen Wash And Bearing Cooling Hdr Supply From SWP 24,25,26)
- FCV-1111 (SWP 24/25/26 Sup To Conv Non Essen Stop)
- FCV-1112 (SWP 21/22/23 Sup To Conv Non Essen Stop)

4.4.13 COORDINATE with the CCR to place the following Service Water Pump Strainer Blowdown valves in the position appropriate for plant conditions:

- SWN-600 (21 SWP Strainer Blowdown Stop Valve)
- SWN-598 (22 SWP Strainer Blowdown Stop Valve)
- SWN-596 (23 SWP Strainer Blowdown Stop Valve)
- SWN-594 (24 SWP Strainer Blowdown Stop Valve)
- SWN-592 (25 SWP Strainer Blowdown Stop Valve)
- SWN-590 (26 SWP Strainer Blowdown Stop Valve)

4.4.14 ENSURE the door opened in Step 4.3.3.3 is CLOSED.

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- _____ 4.4.15 ENSURE the Lube Oil Supply Reservoir is refilled with the proper grade of oil. (SAE 15W – 40 Class A)

- _____ 4.4.16 TURN the 0/MANUAL/AUTO switch to the AUTO position.

4.5 Engine Start (Loss Of AC Power/ SBO)

NOTE

- This section is written for emergency operation. If one of the steps can NOT be met the Supervisor in charge must evaluate continued action.
- If DC control power is not available for breaker operation, breakers may be operated manually using Section 4.9, Manual Breaker and Transfer Switch Operation.
- The starting of the Appendix R DG should not be delayed.
- SO Phone Number: (212) 580-6789
- DO Phone Number: (212) 580-6754

_____ 4.5.1 REQUEST the CCR to initiate the performance of Attachment 4

NOTE

- 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 ENSURE the Delay Gate is Closed

_____ 4.5.2.2 IF the Tool Room Roll-up door will be opened, THEN REQUEST permission from the CCR to open the Tool Room Roll-up door.

- _____ 4.5.2.3 ENSURE one of the following is Open:
 - _____ • The Maintenance Loading Bay overhead door (15' Elevation)
 - _____ • Tool Room Roll-up door (15 'Elevation)
- _____ 4.5.2.4 ENSURE 3 damper set directly west of Appendix R DG is Open (Turbine Building West Wall, above MCC-10V)
- _____ 4.5.3 ENSURE the following Appendix R Diesel Generator Fuel Oil Day Tank Indications are Illuminated:
 - _____ • System Ready Yellow LED flashing
 - _____ • Power Available Green LED illuminated
- _____ 4.5.3.1 CHECK NO abnormal condition exists as indicated by a LED in a flashing ON state and horn sounding.
- _____ 4.5.4 ENSURE that breaker SBO/ASS is OPEN. (SBO/APP R Diesel Generator Switchgear)
- _____ 4.5.5 ENSURE that breaker ASS is OPEN. (SBO/APP. R Switchgear 13.8KV Bus)
- _____ 4.5.6 ENSURE that breaker OSP is OPEN. (SBO/APP. R Switchgear 13.8KV Bus)
- _____ 4.5.7 ENSURE that breaker SBOH is OPEN. (SBO/APP. R Switchgear 13.8KV Bus)
- _____ 4.5.8 ENSURE the following at the Appendix R DG Switch Panel (Control Panel):
 - _____ 4.5.8.1 Shutdown Status indicator – Extinguished
 - _____ 4.5.8.2 Warning Status indicator – Extinguished
- _____ 4.5.9 PLACE the UNIT-PARALLEL switch in UNIT. (SBO/ APP R Switchgear 6.9KV Bus)
- _____ 4.5.10 At the Appendix R DG Switch Panel (Control Panel) PRESS and HOLD the Panel Lamp/Lamp Test button for at least 3 Seconds
 - _____ 4.5.10.1 CHECK all control panel LEDs illuminate
 - _____ 4.5.10.2 RELEASE Panel Lamp/Lamp Test button

_____ 4.5.11 IF City Water will be the cooling source, THEN ALIGN City Water to The Appendix R DG as follows:

_____ 4.5.11.1 OPEN the following:

_____ a) UW-854

_____ b) UW-855

NOTE

Maintaining the City Water flows specified ensures that adequate volume in the City Water Storage Tank is reserved for other plant activities.

_____ 4.5.11.2 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.

_____ 4.5.12 IF Conventional Service Water is available AND the CRS gives permission to use it as the cooling source, THEN ALIGN Conventional 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 160 gpm as indicated by FI-7979, Jacket Water Flow.

NOTE

- 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 OR the warm-up at idle time is completed, the generator will ramp up to rated speed and voltage.

_____ 4.5.13 TURN the 0/MANUAL/AUTO switch to the MANUAL position.

_____ 4.5.14 PRESS AND HOLD the Manual Run/Stop button for a minimum of 3 seconds

_____ 4.5.14.1 RELEASE the Manual Run/Stop button.

NOTE

- The _ _ 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 OR generator synchronized with bus).

_____ 4.5.15 IF Manually closing breaker SBO/ASS,
THEN PRESS the Manual Close Button on the front of the Breaker.

_____ 4.5.16 CLOSE breaker SBO/ASS as follows:

_____ 4.5.16.1 PRESS AND HOLD the _ _ momentary pushbutton until the symbol indicates _ -_ (breaker SBO/ASS closed).

_____ 4.5.16.2 RELEASE the momentary pushbutton.

NOTE

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

_____ 4.5.17 IF a Warning Condition occurs (Warning Status Indicator illuminates yellow), THEN PERFORM the following:

_____ 4.5.17.1 IF the Alarm Module warning horn annunciated, THEN momentarily PUSH the PUSH TO SILENCE HORN button.

_____ 4.5.17.2 REFER to the following for assistance in correcting the condition:

- _____ • ATTACHMENT 2, WARNING AND SHUTDOWN FAULT CODES
- _____ • ATTACHMENT 3, APPENDIX R DG TROUBLESHOOTING PROCEDURES

NOTE

A warning condition can not be reset until the engine is shutdown.

_____ 4.5.17.3 WHEN the condition is corrected, THEN the Warning Status Indicator may be reset as follows:

- _____ a) PRESS the front panel FAULT ACKNOWLEDGE button

NOTE

If a shutdown condition occurs the Shutdown Status Indicator will illuminate red and the engine will shutdown immediately or on a cool-down timer at any time an abnormal condition is sensed:

- _____ 4.5.18 IF a shutdown condition occurs (Shutdown Status Indicator illuminates red), THEN PERFORM the following:
 - _____ 4.5.18.1 IF the Alarm Module warning horn annunciated, THEN momentarily PUSH the PUSH TO SILENCE HORN button.
 - _____ 4.5.18.2 REFER to the following for assistance in correcting the condition:
 - _____ • ATTACHMENT 2, WARNING AND SHUTDOWN FAULT CODES
 - _____ • ATTACHMENT 3, APPENDIX R DG TROUBLESHOOTING PROCEDURES
 - _____ 4.5.18.3 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
 - _____ c) PRESS the front panel FAULT ACKNOWLEDGE button
 - _____ d) PLACE the 0/MANUAL/AUTO switch in AUTO
- _____ 4.5.19 IF desired to ALIGN the Appendix R DG Auxiliaries MCC to the Appendix R DG THEN PERFORM the following:
 - _____ 4.5.19.1 CHECK the generator is at rated speed and voltage as indicated by the LCD display message.
 - _____ 4.5.19.2 CHECK the Appendix R DG Auxiliary Transfer Switch is aligned as follows:
 - _____ a) Source 2 Available (Yellow Light illuminated)

- _____ 4.5.19.3 ROTATE and HOLD 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) WHEN the CHECK Source 2 Connected (Red Light) illuminates, THEN RELEASE the switch
- _____ 4.5.20 CHECK that the DG Area Fan is running
- _____ 4.5.21 ENSURE that breaker SBO/ASS is Closed. (SBO/APP R Diesel Generator Switchgear)
- _____ 4.5.22 ADJUST cooling water throttle valves to maintain normal cooling temperatures.
- _____ • UW-836
 - _____ • UW-840

NOTE

One set of data should be taken, even if engine is operated for less than an hour.

- _____ 4.5.23 IF time permits, THEN RECORD Appendix R DG parameters once per hour using ATTACHMENT 1, APPENDIX R DG DATA SHEETS.

NOTE

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

- _____ 4.5.24 MONITOR Appendix R DG Day Tank Level.
- _____ 4.5.25 MONITOR Lube Oil Supply Reservoir gauge glass level.
- _____ 4.5.25.1 WHEN gauge glass level indicates less than 8 gallons full, THEN REFILL Lube Oil Supply Reservoir with proper grade of oil. (SAE 15W – 40 Class A)
- _____ 4.5.26 CHECK the engine systems for leakage
- _____ 4.5.26.1 IF leakage is observed, THEN INITIATE a WRT as necessary:

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- _____ 4.5.27 ENSURE breaker SBO/ASS is Closed (SBO/APP R Diesel Generator Switchgear)
- _____ 4.5.28 REQUEST the CCR to verify the following breakers are OPEN:
 - _____ 4.5.28.1 GT25
 - _____ 4.5.28.2 GT26
- _____ 4.5.29 CLOSE breaker SBOH. (SBO/APP. R Switchgear 13.8KV Bus)
- _____ 4.5.30 CLOSE breaker SBOL (SBO/APP. R Switchgear 6.9KV Bus)
 - _____ 4.5.30.1 CLOSE breaker SBOL

NOTE

- The Appendix R Diesel Generator's maximum continuous load is 2045 kW. During an emergency, maximum generator load is 2700 kW for 25 hours/yr.
- When starting equipment, coordination with the CRS will be necessary to ensure adequate generator capacity is available.

- _____ 4.5.31 INFORM the CCR that the Appendix R DG is energized up to GT25 and GT26 and ready to be loaded.

4.6 Engine Shutdown From Loss of AC Power (SBO)

- _____ 4.6.1 IF Appendix R DG Auxiliaries are aligned to the DG, THEN ALIGN the Appendix R DG Auxiliaries MCC to MCC 22 as follows:
- _____ 4.6.1.1 CHECK the Appendix R DG Auxiliary Transfer Switch is aligned as follows:
- _____ a) Source 1 Available (White Light illuminated)
- _____ 4.6.1.2 ROTATE and HOLD the Appendix R DG Auxiliaries Normal/Standby Switch in the STANDBY position (Aligned to MCC-22) (Appendix R DG Auxiliaries MCC)
- _____ a) WHEN the CHECK Source 1 Connected (Green Light) illuminates, THEN RELEASE the switch

NOTE

- When restoring to a normal electrical lineup no parallel capability exists with the 13.8KV circuit.
- The following steps will de-energize the 13.8KV Circuit. Coordination with the CRS is required.
- The Appendix R DG is operating in Unit Mode. If paralleled to an Emergency DG, careful coordination between the EDG operator and the Appendix R Diesel operator is required. Load must be transferred in small increments.

- _____ 4.6.2 COORDINATE with the CCR to minimize loads on the Appendix R DG to between 300 and 400 kW .
- _____ 4.6.3 OPEN breaker SBOL. (SBO/APP. R Switchgear 6.9KV Bus)
- _____ 4.6.4 OPEN breaker SBOH. (SBO/APP. R Switchgear 13.8KV Bus)
- _____ 4.6.5 IF directed by CCR, THEN CLOSE breaker OSP. (SBO/APP. R Switchgear 13.8KV Bus)

NOTE

- The preset cool-down time (at rated speed) will vary dependent on the kW output.
- The generator will stop after the cool-down at idle time is expended.

- ___ 4.6.6 PRESS AND RELEASE the Manual Run/Stop button.
- ___ 4.6.6.1 VERIFY engine rotation has stopped.
- ___ 4.6.6.2 ENSURE breaker SBO/ASS is Open. (SBO/APP R Diesel Generator Switchgear)
- ___ 4.6.7 ENSURE breaker SBO/ASS is Open. (SBO/APP R Diesel Generator Switchgear)
- ___ 4.6.8 ENSURE the UNIT/PARALLEL switch in UNIT. (SBO/APP R Switchgear 13.8KV Bus)
- ___ 4.6.9 IF the Appendix R DG Heat Exchangers are aligned to Service Water, THEN ALIGN the Appendix R DG Heat Exchangers to City Water as follows:
- ___ 4.6.9.1 CLOSE SWT-837 to secure Service Water flow.
- ___ 4.6.9.2 OPEN the following:
- ___ a) UW-854
- ___ b) UW-855
- ___ 4.6.9.3 ADJUST Cooling Water flow as follows:
- ___ a) THROTTLE UW-840 to achieve approximately 100 gpm as indicated by FI-7980, Aftercooler Water Flow.
- ___ b) THROTTLE UW-836 to achieve approximately 100 gpm as indicated by FI-7979, Jacket Water Flow.
- ___ 4.6.9.4 WAIT a minimum of 5 minutes for City Water to flush residual Service Water from the Appendix R DG Heat Exchangers and piping.

- _____ 4.6.10 ENSURE the following are Closed to secure City Water to the APPENDIX R DG Heat Exchangers:
 - _____ 4.6.10.1 UW-854
 - _____ 4.6.10.2 UW-855
- _____ 4.6.11 ENSURE the door opened in Step 4.5.2.3 is CLOSED.
- _____ 4.6.12 ENSURE the Lube Oil Supply Reservoir is refilled with the proper grade of oil. (SAE 15W – 40 Class A)
- _____ 4.6.13 TURN the 0/MANUAL/AUTO switch to the AUTO position.

4.7 Engine Start (Supply Unit 3 SBO / ASS Loads)

NOTE

- This section is written for emergency operation. If one of the steps can NOT be met the Supervisor in charge must evaluate continued action.
- If DC control power is not available for breaker operation, breakers may be operated manually using Section 4.9, Manual Breaker and Transfer Switch Operation.
- The starting of the Appendix R DG should not be delayed.
- SO Phone Number: (212) 580-6789
- DO Phone Number: (212) 580-6754

NOTE

- 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

- _____ 4.7.1 PERFORM the following as necessary to prevent exceeding design maximum temperatures:
 - _____ 4.7.1.1 ENSURE the Delay Gate is Closed
 - _____ 4.7.1.2 IF the Tool Room Roll-up door will be opened, THEN REQUEST permission from the CCR to open the Tool Room Roll-up door.
 - _____ 4.7.1.3 ENSURE one of the following is Open:
 - _____ • The Maintenance Loading Bay overhead door (15' Elevation)
 - _____ • Tool Room Roll-up door (15' Elevation)

- _____ 4.7.1.4 ENSURE 3 damper set directly west of Appendix R DG is Open (Turbine Building West Wall, above MCC-10V)

- _____ 4.7.2 ENSURE the following Appendix R Diesel Generator Fuel Oil Day Tank Indications are Illuminated:
 - _____ • System Ready Yellow LED flashing
 - _____ • Power Available Green LED illuminated

- _____ 4.7.2.1 CHECK NO abnormal condition exists as indicated by a LED in a flashing ON state and horn sounding.

- _____ 4.7.3 ENSURE that breaker SBO/ASS is OPEN. (SBO/APP R Diesel Generator Switchgear)

- _____ 4.7.4 ENSURE that breaker ASS is OPEN. (SBO/APP. R Switchgear 13.8KV Bus)

- _____ 4.7.5 ENSURE that breaker GT/25 is OPEN.

- _____ 4.7.6 ENSURE that breaker GT/26 is OPEN.

- _____ 4.7.7 ENSURE that breaker GT/BT is OPEN.

- _____ 4.7.8 CLOSE breaker OSP.

- _____ 4.7.9 CLOSE breaker SBOL.

- _____ 4.7.10 CLOSE breaker SBOH.

- _____ 4.7.11 ENSURE the following at the Appendix R DG Switch Panel (Control Panel):
 - _____ 4.7.11.1 Shutdown Status indicator – Extinguished
 - _____ 4.7.11.2 Warning Status indicator – Extinguished

- _____ 4.7.12 PLACE the UNIT-PARALLEL switch in UNIT. (SBO/ APP R Switchgear 13.8KV Bus)

- _____ 4.7.13 At the Appendix R DG Switch Panel (Control Panel) PRESS and HOLD the Panel Lamp/Lamp Test button for at least 3 Seconds
 - _____ 4.7.13.1 CHECK all control panel LEDs illuminate
 - _____ 4.7.13.2 RELEASE Panel Lamp/Lamp Test button

_____ 4.7.14 IF City Water will be the cooling source, THEN ALIGN City Water to The Appendix R DG as follows:

_____ 4.7.14.1 OPEN the following:

_____ a) UW-854

_____ b) UW-855

_____ 4.7.14.2 ADJUST Cooling Water flow as follows:

_____ a) THROTTLE UW-840 to achieve approximately 90 gpm as indicated by FI-7980, Aftercooler Water Flow.

_____ b) THROTTLE UW-836 to achieve approximately 120 gpm as indicated by FI-7979, Jacket Water Flow.

CAUTION

When Service Water is aligned to supply cooling to the Appendix R DG Heat Exchangers, placing Service Water in service slowly ensures flow will NOT adversely affect the operation of the conventional Service Water header.

_____ 4.7.15 IF Conventional Service Water is available AND the CRS gives permission to use it as the cooling source, THEN ALIGN Conventional Service Water to The Appendix R DG as follows:

_____ 4.7.15.1 OPEN SWT-837

_____ 4.7.15.2 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 160 gpm as indicated by FI-7979, Jacket Water Flow.

NOTE

- 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 OR the warm-up at idle time is completed, the generator will ramp up to rated speed and voltage.

_____ 4.7.16 TURN the 0/MANUAL/AUTO switch to the MANUAL position.

_____ 4.7.17 PRESS AND HOLD the Manual Run/Stop button for a minimum of 3 seconds

_____ 4.7.17.1 RELEASE the Manual Run/Stop button.

NOTE

- The _ _ 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 OR generator synchronized with bus).

_____ 4.7.18 IF Manually closing breaker SBO/ASS,
THEN PRESS the Manual Close Button on the front of the Breaker.

_____ 4.7.19 CLOSE breaker SBO/ASS as follows:

_____ 4.7.19.1 PRESS AND HOLD the _ _ momentary pushbutton until the symbol indicates _ -_ (breaker SBO/ASS closed).

_____ 4.7.19.2 RELEASE the momentary pushbutton.

NOTE

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

_____ 4.7.20 IF a Warning Condition occurs (Warning Status Indicator illuminates yellow), THEN PERFORM the following:

_____ 4.7.20.1 IF the Alarm Module warning horn annunciated, THEN momentarily PUSH the PUSH TO SILENCE HORN button.

_____ 4.7.20.2 REFER to the following for assistance in correcting the condition:

- _____ • ATTACHMENT 2, WARNING AND SHUTDOWN FAULT CODES
- _____ • ATTACHMENT 3, APPENDIX R DG TROUBLESHOOTING PROCEDURES

NOTE

A warning condition can not be reset until the engine is shutdown.

_____ 4.7.20.3 WHEN the condition is corrected, THEN the Warning Status Indicator may be reset as follows:

- _____ a) PRESS the front panel FAULT ACKNOWLEDGE button

NOTE

If a shutdown condition occurs the Shutdown Status Indicator will illuminate red and the engine will shutdown immediately or on a cool-down timer at any time an abnormal condition is sensed:

- _____ 4.7.21 IF a shutdown condition occurs (Shutdown Status Indicator illuminates red), THEN PERFORM the following:
- _____ 4.7.21.1 IF the Alarm Module warning horn annunciated, THEN momentarily PUSH the PUSH TO SILENCE HORN button.
- _____ 4.7.21.2 REFER to the following for assistance in correcting the condition:
- _____ • ATTACHMENT 2, WARNING AND SHUTDOWN FAULT CODES
 - _____ • ATTACHMENT 3, APPENDIX R DG TROUBLESHOOTING PROCEDURES
- _____ 4.7.21.3 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
 - _____ c) PRESS the front panel FAULT ACKNOWLEDGE button
 - _____ d) PLACE the 0/MANUAL/AUTO switch in AUTO
- _____ 4.7.22 IF desired to ALIGN the Appendix R DG Auxiliaries MCC to the Appendix R DG THEN PERFORM the following:
- _____ 4.7.22.1 CHECK the Appendix R DG Auxiliary Transfer Switch is aligned as follows:
- _____ a) Source 2 Available (Yellow Light illuminated)

- _____ 4.7.22.2 ROTATE and HOLD 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) WHEN the CHECK Source 2 Connected (Red Light) illuminates, THEN RELEASE the switch
- _____ 4.7.23 CHECK that the DG Area Fan is running
- _____ 4.7.24 ENSURE that breaker SBO/ASS is Closed. (SBO/APP R Diesel Generator Switchgear)
- _____ 4.7.25 ADJUST cooling water throttle valves to maintain normal cooling temperatures.
- _____ • UW-836
 - _____ • UW-840

NOTE

One set of data should be taken, even if engine is operated for less than an hour.

- _____ 4.7.26 IF time permits, THEN RECORD Appendix R DG parameters once per hour using ATTACHMENT 1, APPENDIX R DG DATA SHEETS.

NOTE

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

- _____ 4.7.27 MONITOR Appendix R DG Day Tank Level.
- _____ 4.7.28 MONITOR Lube Oil Supply Reservoir gauge glass level.
- _____ 4.7.28.1 WHEN gauge glass level indicates less than 8 gallons full, THEN REFILL Lube Oil Supply Reservoir with proper grade of oil. (SAE 15W – 40 Class A)
- _____ 4.7.29 CHECK the engine systems for leakage
- _____ 4.7.29.1 IF leakage is observed, THEN INITIATE a WRT as necessary:

_____ 4.7.30 ENSURE breaker SBO/ASS is Closed (SBO/APP R Diesel Generator Switchgear)

NOTE

- The Appendix R Diesel Generator's maximum continuous load is 2045 kW. During an emergency, maximum generator load is 2700 kW for 25 hours/yr.
- When starting equipment, coordination with UNIT 3 will be necessary to ensure adequate generator capacity is available.

_____ 4.7.31 INFORM the CCR that the Appendix R DG is energized up to GT/BT and ready to be loaded.

4.8 Engine Shutdown From Supplying Unit 3 SBO/ ASSS Loads

_____ 4.8.1 IF Appendix R DG Auxiliaries are aligned to the DG, THEN ALIGN the Appendix R DG Auxiliaries MCC to MCC 22 as follows:

_____ 4.8.1.1 CHECK the Appendix R DG Auxiliary Transfer Switch is aligned as follows:

_____ a) Source 1 Available (White Light illuminated)

_____ 4.8.1.2 ROTATE and HOLD the Appendix R DG Auxiliaries Normal/Standby Switch in the STANDBY position (Aligned to MCC-22) (Appendix R DG Auxiliaries MCC)

_____ a) WHEN the CHECK Source 1 Connected (Green Light) illuminates, THEN RELEASE the switch

NOTE

- When restoring to a normal electrical lineup no parallel capability exists with the 13.8KV circuit.
- The following steps will de-energize the 13.8KV Circuit. Coordination with the CRS is required.
- The Appendix R DG is operating in Unit Mode. If paralleled to an Emergency DG, careful coordination between the EDG operator and the Appendix R Diesel operator is required. Load must be transferred in small increments.

- _____ 4.8.2 COORDINATE with the CCR to minimize loads on the Appendix R DG to between 300 and 400 kW .
- _____ 4.8.3 OPEN breaker SBOL. (SBO/APP. R Switchgear 6.9KV Bus)
- _____ 4.8.4 OPEN breaker SBOH. (SBO/APP. R Switchgear 13.8KV Bus)
- _____ 4.8.5 IF directed by CCR, THEN CLOSE breaker OSP. (SBO/APP. R Switchgear 13.8KV Bus)

NOTE

- The preset cool-down time (at rated speed) will vary dependent on the kW output.
- The generator will stop after the cool-down at idle time is expended.

- _____ 4.8.6 PRESS AND RELEASE the Manual Run/Stop button.
 - _____ 4.8.6.1 VERIFY engine rotation has stopped.
 - _____ 4.8.6.2 ENSURE breaker SBO/ASS is Open. (SBO/APP R Diesel Generator Switchgear)
- _____ 4.8.7 ENSURE the UNIT/PARALLEL switch in UNIT. (SBO/APP R Switchgear 13.8KV Bus)
- _____ 4.8.8 IF the Appendix R DG Heat Exchangers are aligned to Service Water, THEN ALIGN the Appendix R DG Heat Exchangers to City Water as follows:
 - _____ 4.8.8.1 CLOSE SWT-837 to secure Service Water flow.

- _____ 4.8.8.2 OPEN the following:
 - _____ a) UW-854
 - _____ b) UW-855
- _____ 4.8.8.3 ADJUST Cooling Water flow as follows:
 - _____ a) THROTTLE UW-840 to achieve approximately 100 gpm as indicated by FI-7980, Aftercooler Water Flow.
 - _____ b) THROTTLE UW-836 to achieve approximately 100 gpm as indicated by FI-7979, Jacket Water Flow.
- _____ 4.8.8.4 WAIT a minimum of 5 minutes for City Water to flush residual Service Water from the Appendix R DG Heat Exchangers and piping.
- _____ 4.8.9 ENSURE the following are Closed to secure City Water to the APPENDIX R DG Heat Exchangers:
 - _____ 4.8.9.1 UW-854
 - _____ 4.8.9.2 UW-855
- _____ 4.8.10 ENSURE the door opened in Step 4.5.2.3 is CLOSED.
- _____ 4.8.11 ENSURE the Lube Oil Supply Reservoir is refilled with the proper grade of oil. (SAE 15W – 40 Class A)
- _____ 4.8.12 TURN the 0/MANUAL/AUTO switch to the AUTO position.

4.9 Manual Breaker and Transfer Switch Operation

NOTE

Operating the manually close button may require significant force. The rackout tool may be used to assist in pressing the button.

- 4.9.1 IF desired to operate an Appendix R Diesel breaker manually THEN perform the following:
- 4.9.1.1 OPEN the Breaker Cubicle Door.
 - 4.9.1.2 DEPRESS the Manual CLOSE Button
 - 4.9.1.3 CLOSE the Breaker Cubicle Door.
- 4.9.2 IF desired to operate the Appendix R DG Auxiliary Transfer Switch THEN perform the following:
- 4.9.2.1 OPEN the Transfer Switch Door.
 - 4.9.2.2 Pull the top handle down to disconnect the Normal MCC 22 Source.
 - 4.9.2.3 Push the bottom handle down to connect to the Appendix R Diesel Output.
 - 4.9.2.4 CLOSE the Transfer Switch Door.
- 4.9.3 IF desired to operate the Light and Power Bus breakers manually THEN REFER to 2-AOP-SSD-1 (Control Room Inaccessibility Safe Shutdown Control)

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,
PYRSCO, Inc.

5.2.7 FCM Controls & Level Settings Tank Serial Number – 453 9218, Tank
Firmware Version: 01-05, PYRSCO, 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 Sheets

**UNIT 2 APPENDIX R DIESEL GENERATOR
OPERATION**

No: 2-SOP-27.6

Rev: 1

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**ATTACHMENT 1
APPENDIX R DG DATA SHEETS**

(Page 1 of 1)

Date: _____

PARAMETER	FULL LOAD	TIME/ READINGS			
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				
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					
Appendix R DG Other Data					
Day Tank Level	7/8 - Full				
PI-8030, Day Tank Fill Pump Pressure	psig				
TE-8027, Day Tank Oil Cooler Temperature	°F				
Lube Oil Reservoir Sight Glass Level	8 – 29 gals				
LG-8032, Jacket Water Surge Tank Sight Glass Level	1/2 – 3/4				
LG-8031, After Cooler Surge Tank Sight Glass Level	1/2 – 3/4				
TI-908, Jacket Water Heat Exchanger Outlet Temperature	<195°F				
TI-909 After Cooler Heat Exchanger Outlet Temperature	<130°F				
FI-7979, Appendix R DG Jacket Water Flow (City Water)					
FI-7979, Appendix R DG Jacket Water Flow (Service Water)					
FI-7980, Appendix R DG Aftercooler Water Flow (City Water)					
FI-7980, Appendix R DG Aftercooler Water Flow (Service Water)					

* Normal range not specified by vendor.

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

ATTACHMENT 2
WARNING AND SHUTDOWN FAULT CODES
(Page 1 of 4)

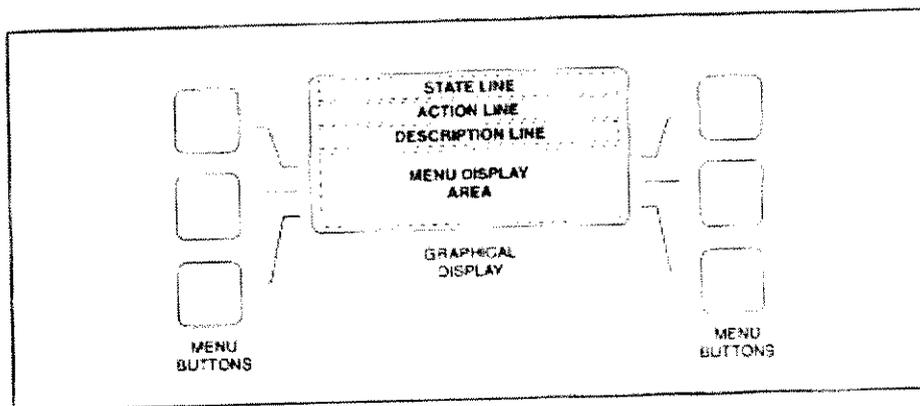


FIGURE 3-3 GRAPHICAL DISPLAY AND MENU SELECTION BUTTONS

NOTE

- 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 not 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 cannot be shut down. Requires repair by qualified service personnel.
- **Category C Fault Codes:** Consist of faults that do not 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 cannot 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.

**ATTACHMENT 2
WARNING AND SHUTDOWN FAULT CODES**
(Page 2 of 4)

CTG	CODE	LAMP	DISPLAYED MESSAGE
A	111	Shtdn	Internal ECM error
A	112	Shtdn	Actuator not responding
B	113	Wrng	Actuator sensor fault
A	115	Shtdn	No speed signal
A	116	Shtdn	Time press sensor high
A	117	Shtdn	Time press sensor low
B	118	Wrng	Pump press sensor high
B	119	Wrng	Pump press sensor low
C	121	Wrng	No engine speed signal
B	122	Wrng	Manifold air press sensor
B	123	Wrng	Manifold air press sensor
C	135	Wrng	Oil pressure sensor
C	141	Wrng	Oil pressure sensor
B	143	Wrng	Low oil pressure
C	144	Wrng	Coolant temperature sensor
C	145	Wrng	Coolant temperature sensor
D	146	Wrng	High coolant temp warning
C	151	Shtdn	High coolant temp alarm
D	152	Wrng	Low coolant temp
C	153	Wrng	Manifold air temp sensor
C	154	Wrng	Manifold air temp sensor
A	155	Shtdn	Manifold air temp alarm
D	197	Wrng	Coolant level warning
C	212	Wrng	Oil temperature sensor
C	213	Wrng	Oil temperature sensor
A	214	Shtdn	High oil temperature
C	221	Wrng	Air pressure sensor
C	222	Wrng	Air pressure sensor
A	228	Shtdn	Low coolant pressure
C	231	Wrng	Coolant pressure sensor
C	232	Wrng	Coolant pressure sensor
A	233	Wrng	Coolant pressure warning
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
A	254	Shtdn	Fuel shutoff valve
C	259	Wrng	Fuel shutoff valve
C	261	Wrng	Fuel temperature sensor
C	263	Wrng	Fuel temperature sensor
C	265	Wrng	Fuel temperature sensor
A	266	Shtdn	Fuel temperature
B	316	Wrng	Fuel supply pump
B	318	Wrng	Fuel supply pump
D	326	Wrng	Oil level warning
B	343	Wrng	Internal ECM error
D	359	Wrng	Engine failed to start
A	378	Wrng	Fueling actuator #1
A	379	Wrng	Fueling actuator #1
A	394	Wrng	Fueling actuator #1
A	395	Wrng	Fueling actuator #1
A	396	Wrng	Fueling actuator #2
A	397	Wrng	Fueling actuator #2
A	398	Wrng	Fueling actuator #2
A	399	Wrng	Fueling actuator #2
B	415	Shtdn	Low oil pressure alarm
B	421	Wrng	High oil temperature
B	423	Wrng	Fuel timing
D	441	Wrng	Low battery voltage
D	442	Wrng	High battery voltage
B	449	Wrng	High fuel supply pressure
B	451	Wrng	Fuel rail pressure sensor
B	452	Wrng	Fuel rail pressure sensor
A	455	Shtdn	Fuel control valve sensor
B	467	Wrng	Timing rail act sensor
B	468	Wrng	Fuel rail actuator sensor
D	471	Wrng	Low oil level
B	482	Wrng	High fuel supply pressure
B	488	Wrng	High intake manifold temp
C	498	Wrng	Oil level sensor
C	499	Wrng	Oil level sensor
A	514	Shtdn	Fuel control valve

**ATTACHMENT 2
WARNING AND SHUTDOWN FAULT CODES**

(Page 3 of 4)

CTG	CODE	LAMP	DISPLAYED MESSAGE
B	546	Wrng	Fuel pressure sensor
B	547	Wrng	Fuel pressure sensor
B	554	Wrng	Fuel rail pressure sensor
B	555	Wrng	Blowby pressure
A	556	Shtdn	Blowby pressure
A	586	Shtdn	Run/Stop switch
A	587	Shtdn	Run/Stop switch
D	611	Wrng	Engine hot
D	688	Shtdn	High oil level alarm
B	689	Wrng	Crank shaft sensor
B	719	Wrng	Blowby pressure sensor
B	729	Wrng	Blowby pressure sensor
B	778	Wrng	Camshaft sensor
E	1311	Shtdn/ Wrng	Customer input #1
E	1312	Shtdn/ Wrng	Customer input #2
E	1313	Shtdn Wrng /	Network Fault 1
E	1314	Shtdn/ Wrng	Network Fault 2
E	1315	Shtdn/ Wrng	Network Fault 3
E	1316	Shtdn/ Wrng	Network Fault 4
E	1317	Shtdn/ Wrng	Customer input #3
E	1318	Shtdn/ Wrng	Customer input #4
B	1319	Wrng	High alternator temp
C	1321	Wrng	Common warning driver
A	1322	Shtdn	Load gov kW setpoint oor hi
A	1323	Shtdn	Load gov kW setpoint oor 10
B	1324	Wrng	Load gov kVAR oor hi
B	1325	Wrng	Load gov kVAR oor lo
B	1326	Wrng	Backup starter disconnect
A	1327	Shtdn	Load gov kW analog oor
D	1328	Wrng	Genset CB tripped
B	1329	Wrng	AVR DC power failure
A	1331	Shtdn	AVR driver shorted
A	1332	Shtdn	Manual switch oor lo

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

ATTACHMENT 3
APPENDIX R DG TROUBLESHOOTING PROCEDURES
(Page 1 of 5)

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
<p>CODE: 146 LAMP: Warning MESSAGE: HIGH COOLANT TEMP WARNING</p>	<p>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 cannot be shut down, use the following:</p> <ul style="list-style-type: none"> 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.
<p>CODE: 151 LAMP: Shutdown MESSAGE: HIGH COOLANT TEMP ALARM</p>	<p>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:</p> <ul style="list-style-type: none"> 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.

ATTACHMENT 3

APPENDIX R DG TROUBLESHOOTING PROCEDURES

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SYMPTOM	CORRECTIVE ACTION
<p>CODE: 152 LAMP: Warning MESSAGE: LOW COOLANT TEMP</p>	<p>Indicates engine coolant heater is not operating or is not circulating coolant. Set is in standby mode but is not operating. Warning occurs when engine jacket water coolant temperature is 70° F (21° C) or lower.</p> <p>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.</p> <p>Check for the following conditions:</p> <ul style="list-style-type: none"> A. Coolant heater not 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.
<p>CODE: 197 LAMP: Warning MESSAGE: COOLANT LEVEL WARNING</p>	<p>Indicates engine jacket water coolant level has fallen to an unacceptable level. If generator is powering critical loads and cannot be shut down, wait until next shutdown period, then follow 235 Coolant Level Alarm procedure. If engine can be stopped, follow 235 procedure.</p>
<p>CODE: 235 LAMP: Shutdown MESSAGE: COOLANT LEVEL ALARM</p>	<p>Indicates engine jacket water coolant level has fallen below the alarm trip point. Allow engine to cool down completely before proceeding.</p> <ul style="list-style-type: none"> 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.
<p>CODE: 253 LAMP: Shutdown MESSAGE: OIL LEVEL ALARM</p>	<p>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.</p>

ATTACHMENT 3

APPENDIX R DG TROUBLESHOOTING PROCEDURES

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SYMPTOM	CORRECTIVE ACTION
<p>CODE: 326 LAMP: Warning MESSAGE: OIL LEVEL WARNING</p>	<p>Indicates that the engine oil level has exceeded the warning trip point for high oil level. If generator is powering critical loads and cannot be shut down, wait until next shutdown period, then follow 688 High Oil Level Alarm procedure. If engine can be stopped follow 688 procedure.</p>
<p>CODE: 359 LAMP: Warning MESSAGE: ENGINE FAILED TO START</p>	<p>Indicates possible fault with control or starting system. Check for the following conditions:</p> <ul style="list-style-type: none"> A. Poor battery cable connections. Clean the battery cable terminals and tighten all connections. B. Discharged or defective battery. Recharge or replace the battery.
<p>CODE: 441 LAMP: Warning MESSAGE: LOW BATTERY VOLTAGE</p>	<p>Indicates battery voltage is below 24 VDC.</p> <ul style="list-style-type: none"> 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 not obtained. D. Check float level if applicable (raise float level).
<p>CODE: 442 LAMP: Warning MESSAGE: HIGH BATTERY VOLTAGE</p>	<p>Indicates battery voltage exceeds 32 VDC.</p> <p>Check float level on battery charger if applicable (lower float level).</p> <p>Check engine DC alternator. Replace engine DC alternator if normal battery charging voltage (24 to 26 VDC) is not obtained.</p>

ATTACHMENT 3
APPENDIX R DG TROUBLESHOOTING PROCEDURES
(Page 4 of 5)

SYMPTOM	CORRECTIVE ACTION
<p>CODE: 471 LAMP: Warning MESSAGE: LOW OIL LEVEL</p>	<p>Indicates engine oil has dropped to an unacceptable level. If generator is powering critical loads and cannot be shut down, wait until next shutdown period, then follow 253 Oil level Alarm procedure. If engine can be stopped follow 253 procedure.</p>
<p>CODE: 611 LAMP: Warning MESSAGE: ENGINE HOT</p>	<p>Indicates that an engine hot shut down has occurred (cool-down 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.</p>
<p>CODE: 688 LAMP: Shutdown MESSAGE: HIGH OIL LEVEL ALARM</p>	<p>Indicates that the engine oil level has exceeded the alarm trip point for high oil level. Check oil level. Drain oil to operating level.</p>
<p>CODE: 1311 through 1318 LAMP: Shutdown/Warning MESSAGE: Customer Defined Fault</p>	<p>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.</p>
<p>CODE: 1416 LAMP: Warning MESSAGE: FAIL TO SHUTDOWN</p>	<p>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.</p>
<p>CODE: 1417 LAMP: Warning MESSAGE: POWER DOWN ERROR</p>	<p>Indicates that the control can not power down due to some unknown condition. Possible drain on battery. Contact an authorized service center for service.</p>
<p>CODE: 1433/1434 LAMP: Shutdown MESSAGE: EMERGENCY STOP - LOCAL / EMERGENCY STOP - REMOTE</p>	<p>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.</p>

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: <ul style="list-style-type: none"> 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 .

ATTACHMENT 4
CCR LINEUP FOR ENERGIZATION OF 480V BUSES
(Page 1 of 5)

1.0 PERFORM the following in the CCR to align the 480 Volt Busses:

- ___ 1.1 ENSURE the following breakers are Open:
- ___ • GT25 (In Pull Out)
 - ___ • GT26 (In Pull Out)

CAUTION

If a fault is suspected on a bus the SM/ CRS must evaluate and authorize prior to energizing the bus.

___ 1.2 IF desired to energize 480V Bus 6A or 3A, THEN PERFORM the following:

___ 1.2.1 ENSURE the following Breakers are Open

- ___ • ST6 (In Pull Out)
- ___ • SS6 (In Pull Out)
- ___ • UT3 (In Pull Out)
- ___ • UT3-ST6 (In Pull Out)
- ___ • UT4-ST6 (In Pull Out)
- ___ • 3AT6A (In Pull Out)
- ___ • 2AT3A (In Pull Out)

___ 1.2.2 SET the flags to Green for all 6.9KV Bus 6 and 3 load breakers.

___ 1.2.3 IF Energizing 480V Bus 3A, THEN PERFORM the following:

___ 1.2.3.1 ENSURE the following breakers are Open:

- ___ • SS3 (In Pull Out)
- ___ • 52/3A (In Pull Out)
- ___ • EG-2B (In Pull Out)

ATTACHMENT 4
CCR LINEUP FOR ENERGIZATION OF 480V BUSES
(Page 2 of 5)

CAUTION

- Proper PPE must be worn for Manual closure of Breaker
- Control Power fuses for Normal Supply Breakers to 480V Buses SHALL NOT be re-installed until the Blackout Relay Reset 480V Bus is reset.

- ___ 1.2.3.2 PLACE all 480V Bus 3A Loads in Pullout.
- ___ 1.2.3.3 REMOVE the control fuses for 52/3A Normal Supply Breaker to Bus 3A
- ___ 1.2.3.4 At the local control station, manually CLOSE 52/3A. (480 Volt Room)
- ___ 1.2.3.5 PLACE the CCR switch for 52/3A in CLOSED (red flag) position
- ___ 1.2.3.6 PERFORM the following to Close UT3-ST6, Bus 3-6 Tie Breaker:
 - ___ • PLACE 6900V Bus 3 synchroscope switch in BUS 3 - BUS 6.
 - ___ • CLOSE Bus 3-6 Tie Breaker UT3-ST6
 - ___ • PLACE 6900V Bus 3 synchroscope switch to OFF.
- ___ 1.2.3.7 CLOSE SS3 STA, Service Trans 3 Supply Breaker.
- ___ 1.2.3.21.2.3.8 WHEN the Appendix R Diesel Operator has power up to GT26 and is ready to load the diesel, THEN CLOSE GT26.

ATTACHMENT 4
CCR LINEUP FOR ENERGIZATION OF 480V BUSES
(Page 3 of 5)

CAUTION

The Appendix R Diesel Generator's maximum continuous load is 2045 kW. During an emergency, maximum generator load is 2700 kW for 25 hours/yr.

___ 1.2.4 IF Energizing 480V Bus 6A, THEN PERFORM the following:

___ 1.2.4.1 ENSURE the following breakers are Open:

- ___ • 52/6A (In Pull Out)
- ___ • EG-3 (In Pull Out)

CAUTION

- Proper PPE must be worn for Manual closure of Breaker
- Control Power fuses for Normal Supply Breakers to 480V Buses SHALL NOT be re-installed until the Blackout Relay Reset 480V Bus is reset.

___ 1.2.4.2 PLACE all 480V Bus 6A Loads in Pullout.

___ 1.2.4.3 REMOVE the control fuses for 52/6A, Normal Supply Breaker to Bus 6A

___ 1.2.4.4 At the local control station, manually CLOSE 52/6A. (480 Volt Room)

___ 1.2.4.5 PLACE the CCR switch for 52/6A in CLOSED (red flag) position

___ 1.2.4.6 CLOSE SS6 STA Service Trans 6 Supply Breaker.

ATTACHMENT 4
CCR LINEUP FOR ENERGIZATION OF 480V BUSES
(Page 4 of 5)

CAUTION

The Appendix R Diesel Generator's maximum continuous load is 2045 kW. During an emergency, maximum generator load is 2700 kW for 25 hours/yr.

_____ 1.2.4.7 WHEN the Appendix R Diesel Operator has power up to GT26 and is ready to load the diesel, THEN CLOSE GT26.

_____ 1.3 IF desired to Energize 480V Bus 5A OR 2A, THEN PERFORM the following:

_____ 1.3.1 ENSURE the following breakers are Open

- _____ • ST5 (In Pull Out)
- _____ • SS5 (In Pull Out)
- _____ • UT2 (In Pull Out)
- _____ • UT1-ST5 (In Pull Out)
- _____ • UT2-ST5 (In Pull Out)
- _____ • 2AT3A (In Pullout)
- _____ • 2AT5A (In Pull Out)

_____ 1.3.2 SET the flags to Green for all 6.9KV Bus 5 and 2 load breakers.

_____ 1.3.3 IF Energizing 480V Bus 2A, THEN PERFORM the following:

_____ 1.3.3.1 ENSURE the following breakers are Open:

- _____ • SS2 (In Pull Out)
- _____ • 52/2A (In Pull Out)
- _____ • EG-2A (In Pull Out)

ATTACHMENT 4
CCR LINEUP FOR ENERGIZATION OF 480V BUSES
(Page 5 of 6)

CAUTION

- Proper PPE must be worn for Manual closure of Breaker
- Control Power fuses for Normal Supply Breakers to 480V Buses SHALL NOT be re-installed until the Blackout Relay Reset 480V Bus is reset.

- ___ 1.3.3.2 PLACE all 480V Bus 2A Loads in Pullout.
- ___ 1.3.3.3 REMOVE the control fuses for 52/2A Normal Supply Breaker to Bus 2A
- ___ 1.3.3.4 At the local control station, manually CLOSE 52/2A. (480 Volt Room)
- ___ 1.3.3.5 PLACE the CCR switch for 52/2A in CLOSED (red flag) position
- ___ 1.3.3.6 PERFORM the following to Close UT2-ST5, Bus 2-5 Tie Breaker:
 - ___ a) PLACE 6900V Bus 2 synchroscope switch in BUS 2 - BUS 5.
 - ___ b) CLOSE UT2-ST5, Bus 2-5 Tie Breaker
 - ___ c) PLACE 6900V Bus 2 synchroscope switch to OFF.
- ___ 1.3.3.7 CLOSE SS2 STA, Service Trans 2 Supply Breaker.

CAUTION

The Appendix R Diesel Generator's maximum continuous load is 2045 kW. During an emergency, maximum generator load is 2700 kW for 25 hours/yr.

- ___ 1.3.3.8 WHEN the Appendix R Diesel Operator has power up to GT25 and is ready to load the diesel, THEN CLOSE GT25.

ATTACHMENT 4
CCR LINEUP FOR ENERGIZATION OF 480V BUSES
(Page 6 of 6)

___ 1.3.4 IF Energizing 480V Bus 5A, THEN PERFORM the following:

___ 1.3.4.1 ENSURE the following breakers are Open:

- ___ • 52/5A (In Pull Out)
- ___ • EG-1 (In Pull Out)

CAUTION

- Proper PPE must be worn for Manual closure of Breaker
- Control Power fuses for Normal Supply Breakers to 480V Buses SHALL NOT be re-installed until the Blackout Relay Reset 480V Bus is reset.

___ 1.3.4.2 PLACE all 480V Bus 5A Loads in Pullout.

___ 1.3.4.3 REMOVE the control fuses for 52/5A, Normal Supply Breaker to Bus 5A

___ 1.3.4.4 At the local control station, manually CLOSE 52/5A. (480 Volt Room)

___ 1.3.4.5 PLACE the CCR switch for 52/5A in CLOSED (red flag) position

___ 1.3.4.6 CLOSE SS5 STA, Service Trans 5 Supply Breaker.

CAUTION

The Appendix R Diesel Generator's maximum continuous load is 2045 kW. During an emergency, maximum generator load is 2700 kW for 25 hours/yr.

___ 1.3.4.7 WHEN the Appendix R Diesel Operator has power up to GT25 and is ready to load the diesel, THEN CLOSE GT25.

___ 1.4 COORDINATE with the Appendix R DG Operator to energize necessary loads.