BEFORE STARTING

CAUTION

The engine's exhaust contains harmful emissions. **ALWAYS have adequate ventilation when operating.** Direct exhaust away from nearby personnel.

WARNING

NEVER manually start the engine with the **main, GFCI or auxiliary** circuit breakers in the **ON** (closed) position.

1. Place the **main, G.F.C.I., and aux.** circuit breakers (Figure 34) in the **OFF** position prior to starting the engine.

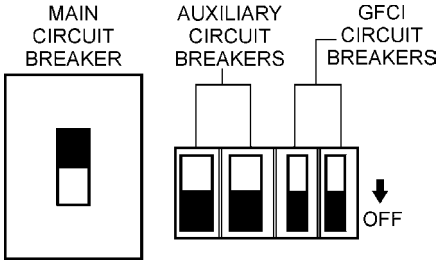

Figure 34. Main, Aux. and GFCI Circuit Breakers (OFF)

2. Make sure the **voltage change-over board** has been configured for the desired output voltage.
3. Connect the load to the **receptacles** or the **output terminal lugs** as shown in Figure 10. These load connection points can be found on the output terminal panel and the output terminal panel's hard wire hookup panel.
4. Tighten terminal nuts securely to prevent load wires from slipping out.
5. Close all engine enclosure doors (Figure 35).

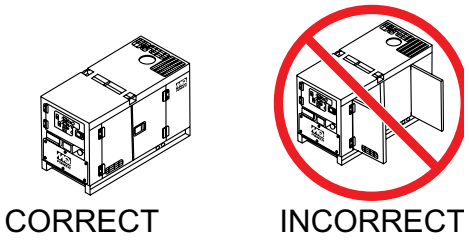

Figure 35. Engine Enclosure Doors

STARTING (MANUAL)

1. Place the ***Auto-Off/Reset Manual Switch*** in the **MANUAL** position to start the engine (Figure 36).

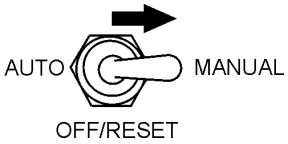

Figure 36. *Auto-Off/Reset* Manual;Switch (Manual Position)

NOTICE

If engine fails to start in a specified number attempts, the shutdown lamp will illuminate and the Auto-Off/ Reset Switch must be place in the Off/Reset position before the engine can be restarted.

NOTICE

Engine will pre-heat automatically in cold weather conditions." Glow Plug Hold " message will be displayed and the engine will start automatically after pre-heating.

2. Once the engine starts, let the engine run for 1-2 minutes (let engine idle longer in cold weather conditions). Listen for any abnormal noises. If any abnormalities exist, shut down the engine and correct the problem.
3. The generator's frequency meter (Figure 37) should be displaying the 60 cycle output frequency in **HERTZ.**

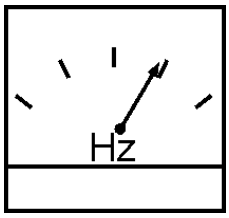

Figure 37. Frequency Meter

4. The generator's AC-voltmeter (Figure 38) will display the generator's output in **VOLTS**. If the voltage is not within the specified tolerance.

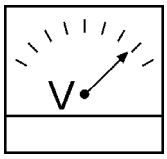

Figure 38. Voltmeter

5. Use the voltage adjustment control knob (Figure 39) to increase or decrease the desired voltage.

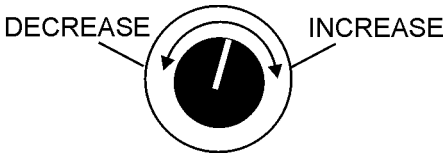

Figure 39. Voltage Adjust Control Knob

6. The ammeter (Figure 40) will indicate **zero amps** with no load applied. When a load is applied, the ammeter will indicate the amount of current that the load is drawing from the generator.

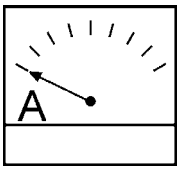

Figure 40. Ammeter (No Load)

7. The engine oil pressure gauge (Figure 41) will indicate the oil pressure of the engine. Under normal operating conditions the oil pressure is approximately 35 to 65 psi. (193~586 kPa).

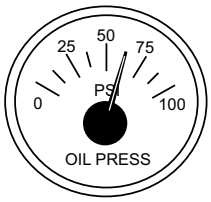

Figure 41. Oil Pressure Gauge

8. The **coolant temperature gauge** (Figure 42) will indicate the coolant temperature. Under normal operating conditions the coolant temperature should be between 180°~225°F (75°~95°C) (**Green Zone**).

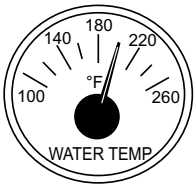

Figure 42. Coolant Temperature Gauge

9. The **tachometer gauge** (Figure 43) will indicate the speed of the engine when the generator is operating. Under normal operating conditions this speed is approximately 1800 RPM's.

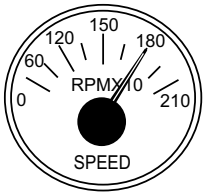

Figure 43. Engine Tachometer Gauge

10. Place the **main, GFCI, and aux.** circuit breakers in the **ON** position (Figure 44).

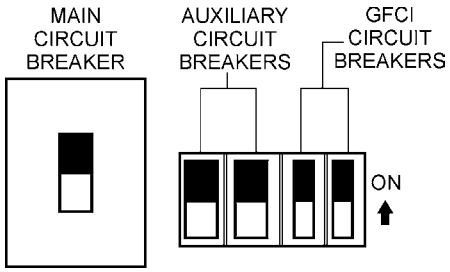

Figure 44. Main, Aux. and GFCI Circuit Breakers (ON)

11. Observe the generator's ammeter (Figure 45) and verify it reads the anticipated amount of current with respect to the load. The ammeter will only display a current reading if a load is in use.

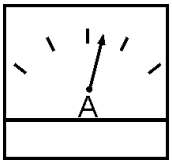

Figure 45. Ammeter (Load)

12. The generator will run until manually stopped or an abnormal condition occurs.

STARTING (AUTO MODE)

DANGER

Before connecting this generator to any building's electrical system, a **licensed electrician** must install an **isolation (transfer) switch.** Serious damage to the building's electrical system may occur without this transfer switch.

CAUTION

When connecting the generator to a isolation (transfer) switch, **ALWAYS** have power applied to the generator's internal battery charger. This will ensure that the engine will not fail due to a dead battery.

NOTICE

When the generator is set in the **AUTO** mode, the generator will **automatically start** in the event of commercial power falling below a prescribed level by means of a contact closure that is generated automatically by a transfer switch.

WARNING

When running the generator in the **AUTO** mode, remember the generator can start up at any time without warning. **NEVER** attempt to perform any maintenance when the generator is in the auto mode.

CAUTION

The engine speed switch **must** be set to the "High" position when running in the **auto-start** mode. Failing to set the switch in the proper position can result in damage to your generator when it turns on.

NOTICE

When the ***Auto Off/Reset Manual*** switch is placed in the **AUTO** position, the engine glow plugs will be warmed and the engine will start automatically.

When starting generator in **AUTO** mode use the "Manual Start-up" procedure except where noted (see below).

1. Perform steps 1 through 5 in the Before Starting section as outlined in the Manual Starting Procedure.
2. Place the **Auto Off/Reset Manual Switch** (Figure 46) in the **AUTO** position.

Figure 46. Auto Off/Reset Manual Switch (AUTO)

3. Continue operating the generator as outlined in the Manual Start-up procedure (start at step 3).

WARNING

NEVER stop the engine suddenly except in an emergency.

NORMAL SHUTDOWN PROCEDURE

To shutdown the generator, use the following procedure:

1. Place both the **MAIN, GFCI and LOAD** circuit breakers as shown in Figure 47 to the **OFF** position.

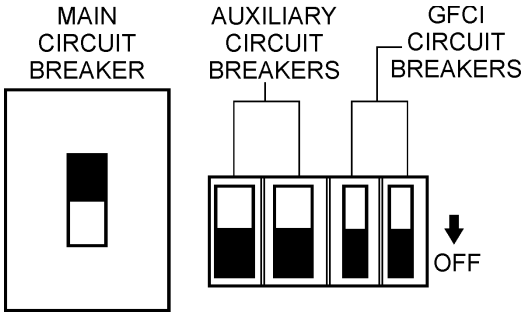

Figure 47. Main, Aux. and GFCI Circuit Breakers (OFF)

2. Let the engine cool by running it at low speed for 3-5 minutes with no load applied.
3. Place the **Auto Off/Reset Manual Switch** (Figure 48) in the **OFF/RESET** position.

Figure 48. Auto Off/Reset Manual Switch (Off/Reset)

4. Verify that all status LEDs on the ECU control panel are **OFF** (not lit).
5. Remove all loads from the generator.
6. Inspect entire generator for any damage or loosening of components that may have occurred during operation.

EMERGENCY SHUTDOWN PROCEDURE

1. Place both the **MAIN, GFCI and LOAD** circuit breakers as shown in Figure 47 to the **OFF** position.

AUTOMATIC SHUT-DOWN SYSTEM

This unit is equipped with safety devices to automatically stop the engine in the event of low oil pressure, approximately 14 psi (97 kPa), or high water temperature, approximately 212° F (100° C), overspeed approximately +15%. The alarm lamps on the ECU illuminate to signify the reason for the shutdown.

NOTICE

Before inspecting generator, check that the Auto/Manual switch is in the **OFF/RESET** position, and place all circuit breakers in the **OFF** position. Allow sufficient time for adequate cooling. When ready to restart, complete all steps in the Generator Startup Procedure section of this manual.

Practically all breakdowns can be prevented by proper handling and maintenance inspections, but in the event of a breakdown, use Table 16 shown below for diagnosis of the Generator. If the problem cannot be remedied, consult our company's business office or service plant.

Table 16. Generator Troubleshooting

Symptom	Possible Problem	Solution
No Voltage Output	AC Voltmeter defective?	Check output voltage using a voltmeter.
	Is wiring connection loose?	Check wiring and repair.
	Is AVR defective?	Replace if necessary.
	Defective Rotating Rectifier?	Check and replace.
	Defective Exciter Field?	Check for approximately 19 ohms across J & K on CN1
Low Voltage Output	Is engine speed correct?	Turn engine throttle lever to "High".
	Is wiring connections loose?	Check wiring and repair.
	Defective AVR?	Replace if necessary.
High Voltage Output	Is wiring connections loose?	Check wiring and repair.
	Defective AVR?	Replace if necessary.
Circuit Breaker Tripped	Short Circuit in load?	Check load and repair.
	Over current?	Confirm load requirements and reduce.
	Defective circuit breaker?	Check and replace.
	Over current Relay actuated?	Confirm load requirement and replace.