

Chapter 4

Controls and Instruments

A complex set of controls and instruments monitors the operation of an electric generator set. Equipment operators must understand what these controls and instruments monitor and how they work. Information about many controls and instruments is included in this chapter. Additional information about the controls and instruments for a specific generator set is in the manual issued with the set.

ENGINE CONTROLS

The controls and instruments used to operate a generator set are installed in a control panel similar to the one on page 63. Descriptions of many of these controls follow. The number in parentheses after the control name corresponds to the callout in the illustration.

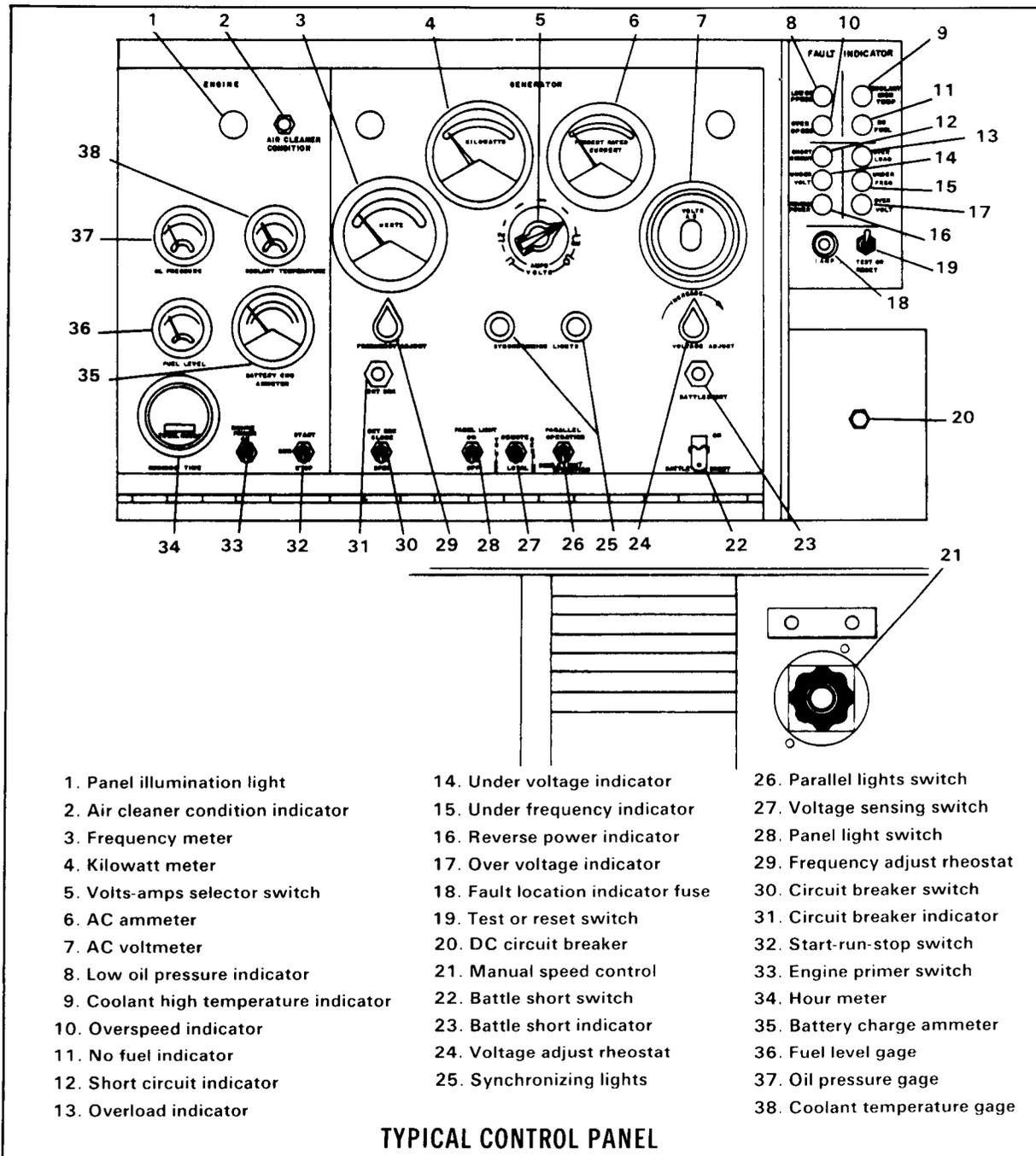
DC circuit breaker (20). Protects DC circuits against shorts and emergency stops.

Start-run-stop switch (32). When pressed in the start position, this switch completes the battery circuit to start the motor. The switch is released and returns to the run position after the generator starts. The switch remains in the run position until placed in the stop position.

Manual speed control (21). Regulates the speed of the engine.

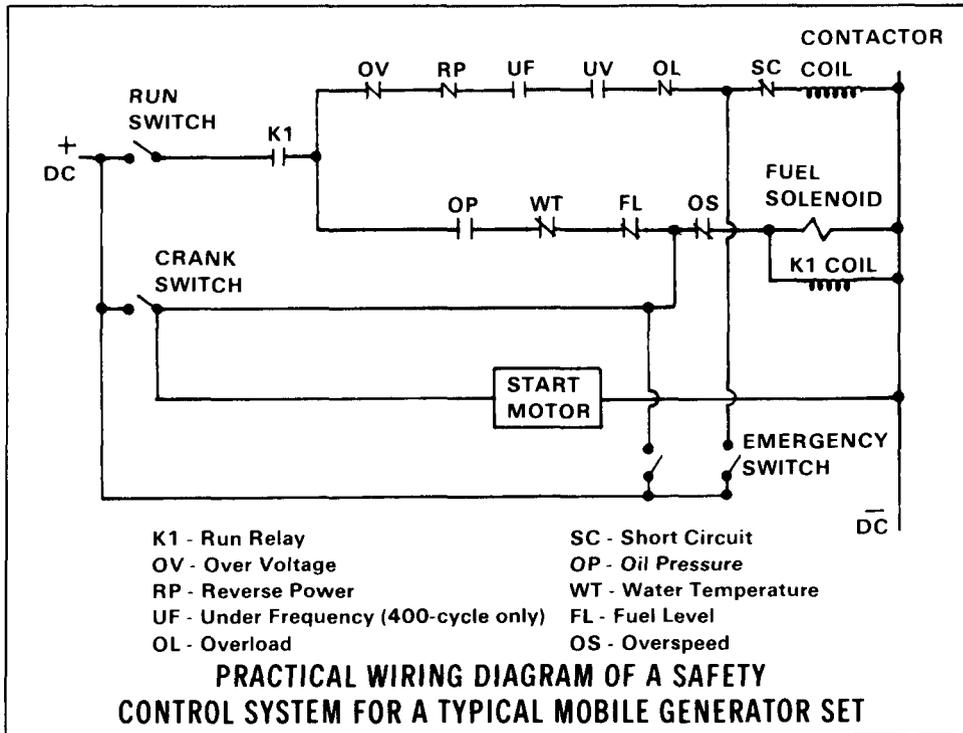
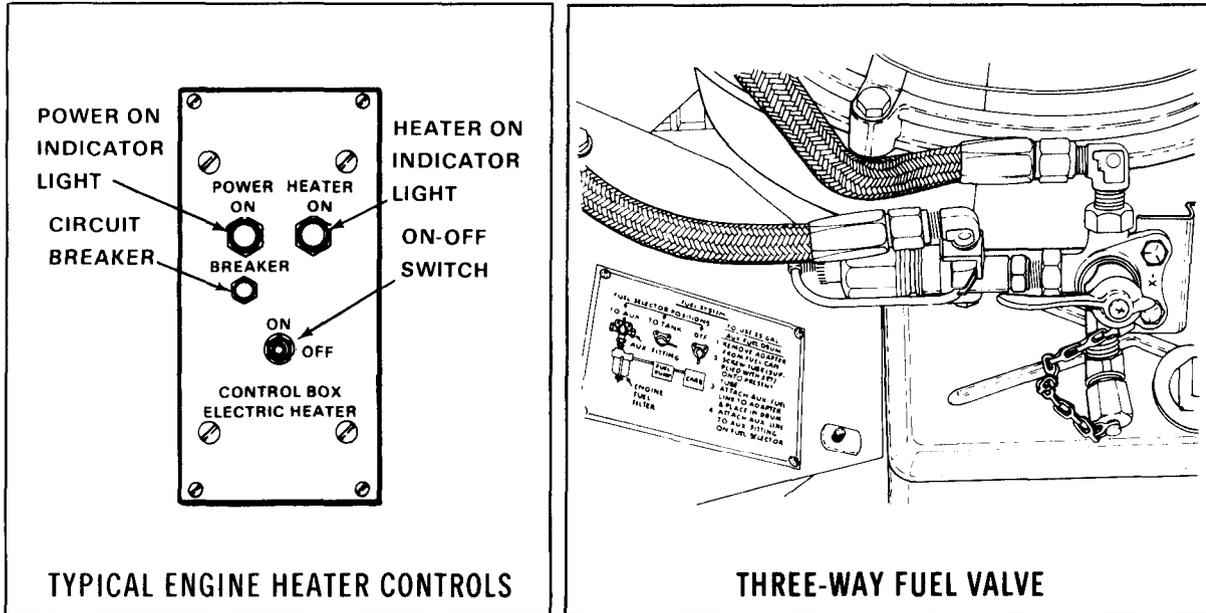
Engine heater controls (figure at the upper left of page 64). Operate the engine's heater. The control set includes a circuit breaker, a heater on indicator light (press-to-test light), and an on-off switch. The press-to-test light is on when the heater is operating.

Three-way fuel valve (figure at upper right of page 64). Directs the flow of fuel from the source of supply to the fuel pump. The valve has three positions—auxiliary fuel tank, set fuel tank, and off. The first two positions indicate the fuel source. For example, when the valve handle is in the set fuel tank position, fuel is drawn from the tank on the generator set.



SAFETY CONTROLS

Most generator sets have a safety control system similar to the one in the figure at the bottom of page 64. The system consists of relays, overspeed safety devices, and pressure-temperature controls. The generator shuts down when a safety device actuates. Safety devices stop the engine or

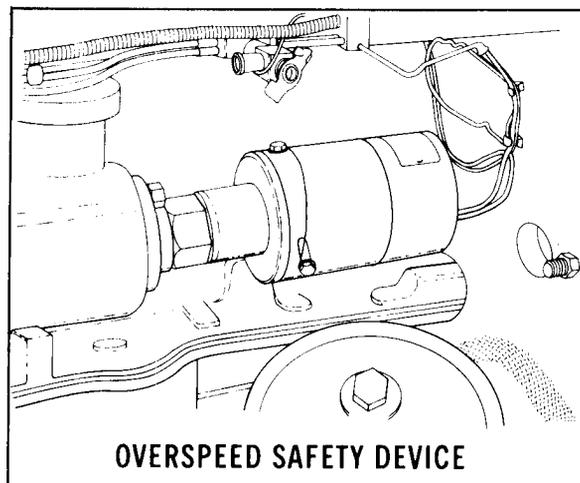


trip the circuit breaker in cases of overspeeding, low fuel level, low oil pressure, or high coolant temperature.

Low oil pressure indicator (8). Illuminates when the oil pressure drops enough to actuate the low oil pressure safety device.

Coolant high temperature indicator (9). Illuminates when the coolant temperature rises enough to actuate the coolant high temperature safety device.

Overspeed indicator (10). Illuminates when the engine speed exceeds the rated RPM and the overspeed safety device actuates.



No fuel indicator (11). Illuminates when fuel in the tank is low enough to actuate the no fuel protective device.

Battle short switch (22). Permits emergency operation of the generator. This four-pole, on-off switch prevents the generator from starting after a safety device actuates by locking out the starter circuit. It bypasses all protective device circuits except the overspeed and short circuits. During normal operations the battle short switch is in the off position.

ENGINE INSTRUMENTS

Several instruments monitor the engine's operation. Most of the following instruments are on the control panel shown on page 63:

Oil pressure gage (37). Indicates the amount of oil pressure maintained in the engine.

Coolant temperature gage (38). Indicates the temperature of the engine coolant.

Fuel level gage (36). Indicates the amount of fuel in the main tank.

Battery charge ammeter (35). Indicates the condition of the batteries and charging system.

Hour (Time-totalizing) meter (34). Indicates the amount of time the generator set has operated.

Exhaust gas temperature gage (not shown). Indicates the temperature of exhaust gases during engine operation. This gage is only on gas turbine engine-driven generators.

Tachometer (not shown). Indicates the engine speed at any time during operation. This meter is only on gas turbine engine-driven generators.

AC GENERATOR CONTROLS

The following controls monitor the operation of an AC generator. The number in parentheses corresponds to the callout on the control panel on page 63.

Volts-amps selector switch (5). Provides current and voltage readings for each generator phase. A meter is connected to each phase of the main generator. Most switches have six positions that are plainly marked on the face of the selector plate.

Phase selector switch (figure on page 47). Changes the output of a generator to match the voltage and phase requirements of the load. This rotary-type switch is used on generators that produce as much as 10 kw of electricity; changeover boards are used for generators that produce 15 kw or more.

Parallel lights switch (26). Closes the synchronizing lights circuit in preparation for paralleling two or more power units. It usually is a two-position, rotary or toggle switch.

Voltage adjust rheostat (24). Adjusts the value of the output voltage. The rheostat is a small, variable resistor.

Circuit breaker switch (30). Disconnects and connects the load lines from the generator set. Acts as a main switch and as an overload protective device. The circuit breaker automatically disconnects the load from the generator in case of overload, short circuit, or ground on the load lines or within the equipment being powered.

AC GENERATOR METERS

The following meters monitor the output from an AC generator:

AC ammeter (6). Indicates the current output of the generator. The output usually is a percentage of the rated load.

AC voltmeter (7). Indicates the voltage of the output terminals and, therefore, the voltage output of the generator.

Frequency (Hertz) meter (3). Indicates the line frequency of the generator output in cycles per second. This dial-type meter is used for 50-, 60-, and 400-cycle generators.

Kilowatt meter (4). Indicates output from the generator. The output reading, in percent of kilowatts, must not exceed the rated capacity of the power plant. The operator must reduce the load if the output reading exceeds the rated capacity of the power plant.

MISCELLANEOUS CONTROLS AND ACCESSORIES

The following controls operate the winterization equipment. The convenience outlets are used with AC generators.

Heater on/off switch (figure on upper left of page 64). Turns the engine heater on and off.

Heater circuit breaker. Protects the heater's electrical circuit from accidental overloads.

120-volt AC convenience outlets. Provide outlets for lights around the generator set. Fuses or a circuit breaker protect the outlets from overloads.

