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Three Source Systems by GeneratorJoe

Three-Source Systems

When there is a power outage, if the engine in a two-source system *does not start* or *fails while running,* then the loads are left without power. When such a situation cannot be tolerated, a *secondary emergency source* should be considered, Figure 1.

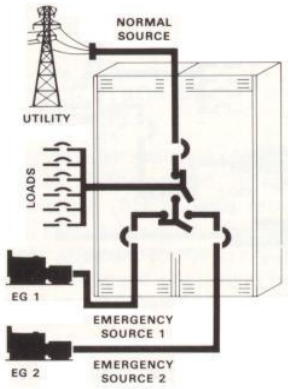

Figure 1.
Three-source system: one normal, two emergency sources, one load.

This three-source system is the same as the two-source system except that a second engine generator is added to back up the first one *if it fails.* As figure 1 shows, a second transfer switch is also added to select the "live" generator. A second circuit breaker and engine controls are added too. Because of these additions, a second enclosure is needed to house the three-source system.

How It Works

When there is a power failure on the normal (utility) source in a three-source system, Figure 1, the controls automatically signal both engines to start. The first engine generator set to provide acceptable voltage and frequency is picked up by the lower transfer switch, ATS 2 in Figure 2. Engine generator set 2 was the first to attain acceptable voltage and frequency in Figure 2. *see note.

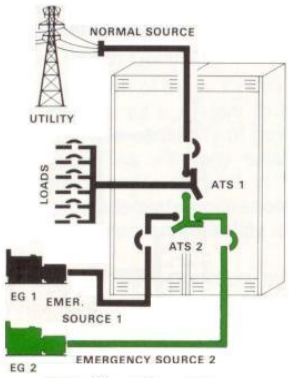

Figure 2
Engine Generator 2 is ready to be put on-line by automatic transfer switch ATS 1.

As soon as the first available engine generator has been selected, then the upper transfer switch, ATS 1, transfers the loads to that generator, Figure 3.

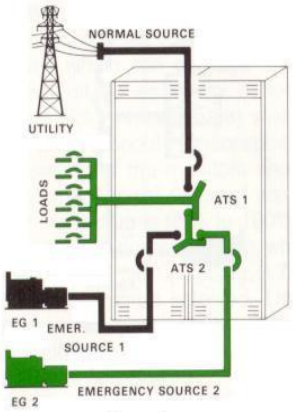

Figure 3.
Loads being supplied from emergency source 2 in a three-source system.

If engine generator 1 is now also running, it will be shut down after a time delay. If engine generator 2 fails at any time, engine generator 1 will be started and put on-line to supply the loads as shown in Figure 4.

*The system can be set to select generator 1 or 2 as first up and alternate them as the first up.

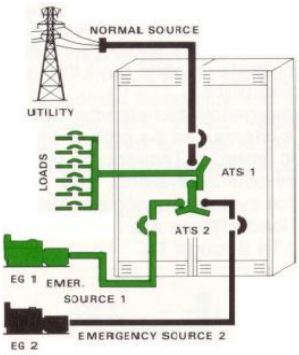

Figure 4.
Loads being supplied from emergency source 1 in a three-source system.

When the normal source is restored, the controls return the loads to it and shut down the engine after allowing it to cool off by running unloaded for a period of time, as noted in Figure 5.

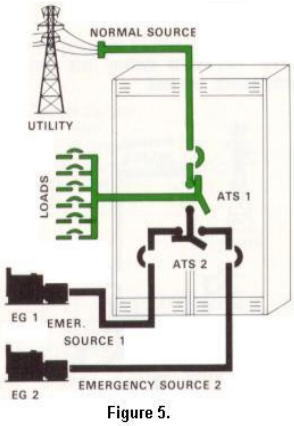

Figure 5.
Loads being supplied from the normal source in a three-source system.

All operations, from startup to retransfer and shutdown are handled automatically by the controls of the three-source system contained in the two enclosures. A three-source system can also consist of two separate utility sources and one engine generator.

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