

Appendix A

Bibliography

The following were used as general references in developing the content of this Application Manual:

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7. Smeaton, Robert W., Switchgear and Control Handbook, McGraw Hill, 1977.
8. Ayraud, Stephen and Thumann, Albert, Introduction to Efficient Electrical Systems Design, Fairmont Press, 1985.
9. Standard for Safety, Transfer Switch Equipment, Underwriters Laboratories, Inc., Fifth Edition, 1996.
10. Motors and Generators, National Electrical Manufacturers Association, NEMA Standard MG 1–1998.

Appendix B

Alternative Power Generation System Arrangements

Basic Standby

Basic protection of the electrical service requires one generator set, one utility-to-generator set transfer switch, and two distribution panels as shown in **Figure 32**. One distribution panel feeds utility power to the nonessential loads and the other feeds power to the essential loads. In this application, the transfer switch connects standby generator set power to the essential loads only.

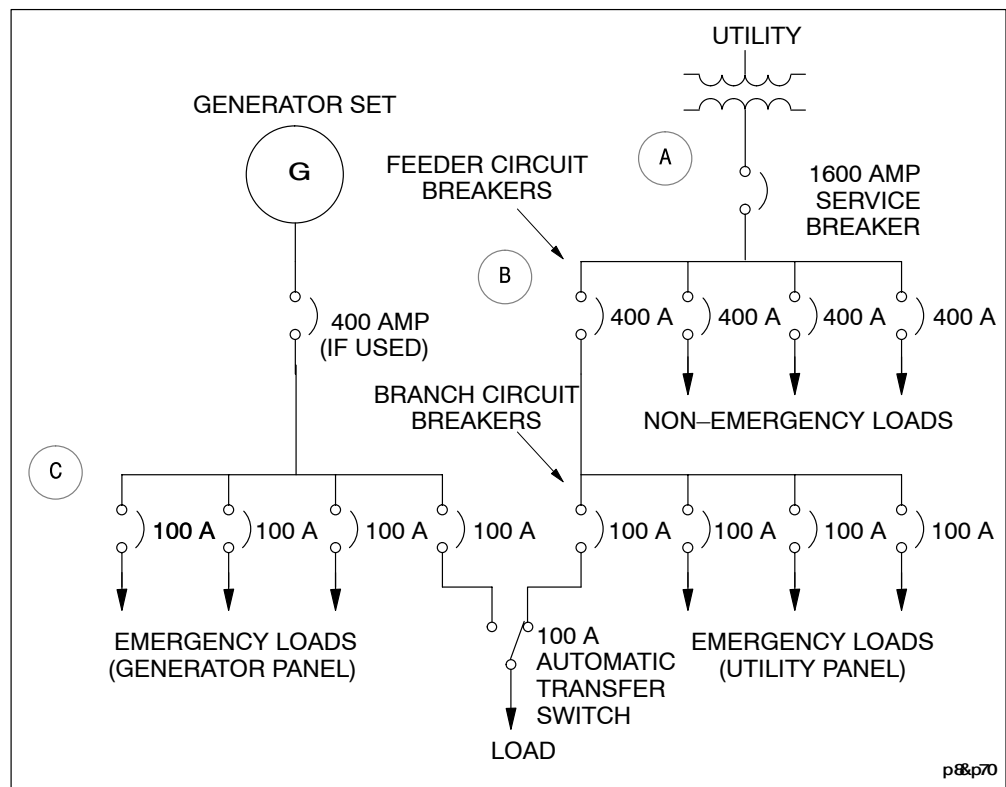


Figure 32. Basic Standby Protection.

Redundant Standby

In a redundant standby arrangement, shown in **Figure 33**, the utility line is backed up by a generator set, which is in turn, backed up by a second generator set. Under normal conditions, the load is supplied with power from the Normal source. If the Normal power source is interrupted, the load is transferred to the first generator set. If the first generator set fails to start or fails during operation, the load is transferred to the second generator set. When Normal power returns, the load is retransferred to the Normal power source.

Redundant Standby (cont'd)

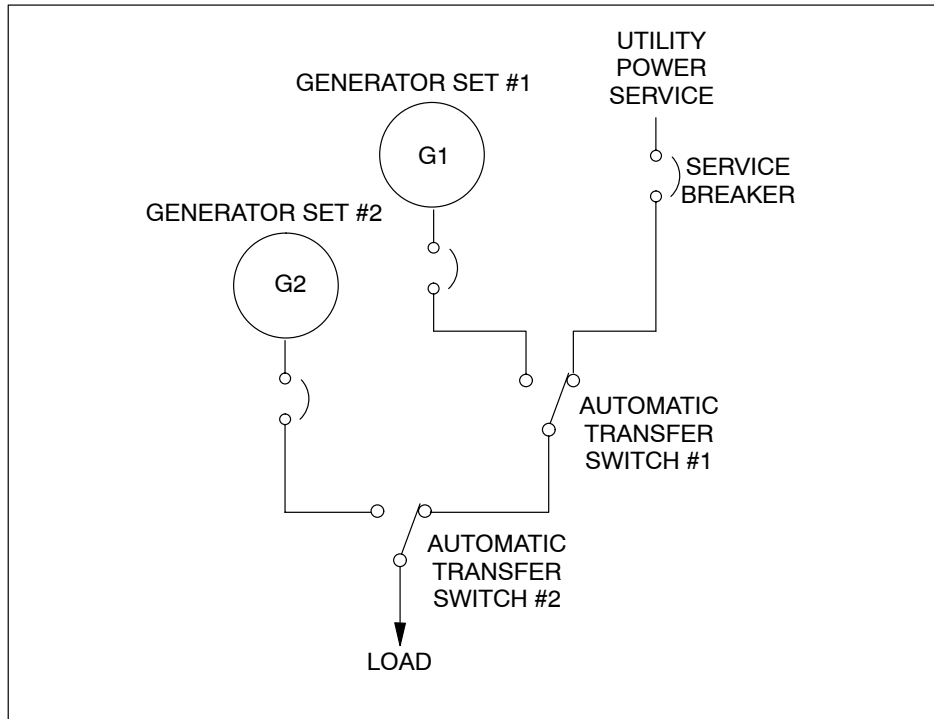


Figure 33. Redundant Standby.

Automatic Priority Selection

The priority selection arrangement, shown in **Figure 34**, uses three transfer switches and two generator sets and allows either of two generator sets to be connected to the critical load during a power outage. Priority load 2 receives emergency power from generator set 2 only if load 1 is receiving power from the normal power source or from generator set 1. If generator set 1 fails during a power outage, automatic transfer switch 3 performs two primary functions. The first is to transfer generator set 2 power to the critical load. The second function is to send a load shed signal to transfer switch 2. Applied to transfer switch 2, the load shed function disconnects generator set 2 from the noncritical loads.

Automatic Priority Selection (cont'd)

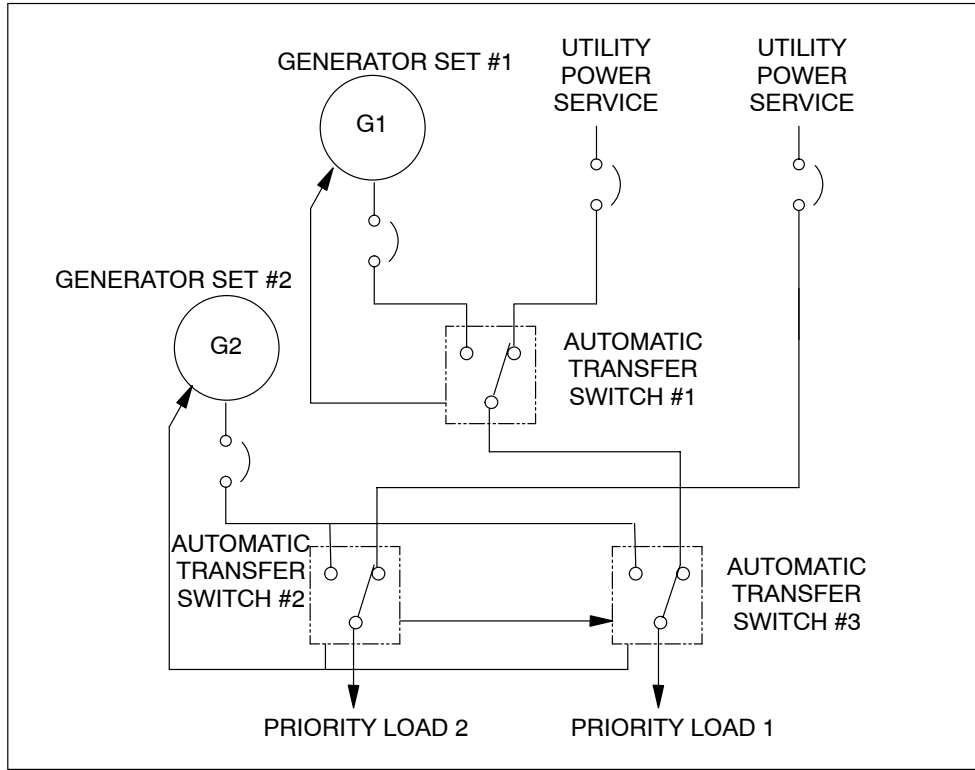


Figure 34. Automatic Priority Selection.

Sequential Prime Power

The sequential prime power arrangement uses three generator sets, running at alternate times, to provide power to a load. This arrangement requires three generator sets and two automatic transfer switches, as shown in **Figure 35**. If generator set 1 fails to operate within a selected range of voltage and (optionally) frequency, transfer switch 1 automatically starts and connects generator set 2. If generator set 2 fails to operate within a selected range of voltage and (optionally) frequency, transfer switch 2 automatically starts and connects generator set 3.

**Sequential Prime Power
(cont'd)**

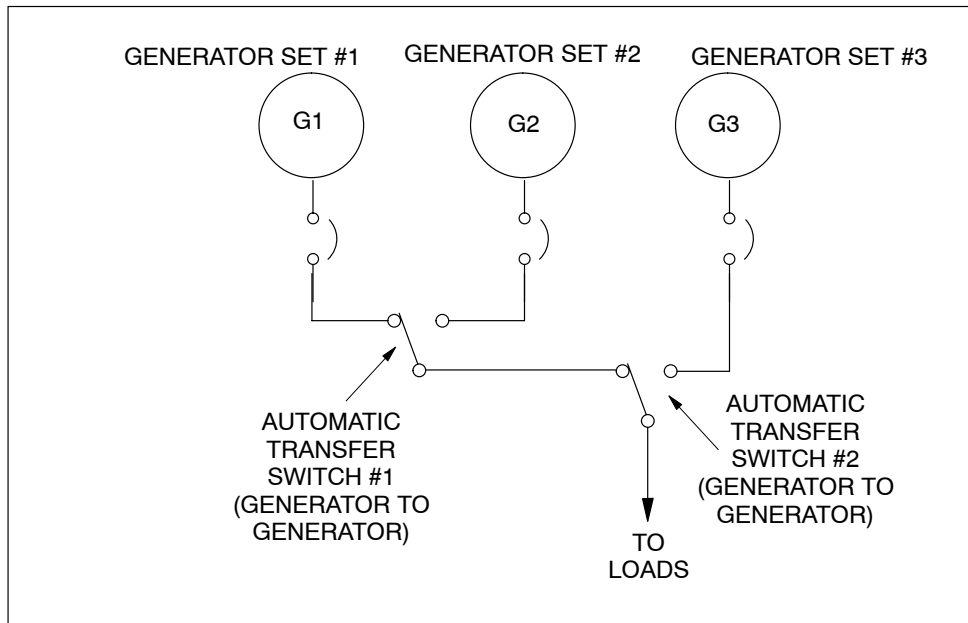


Figure 35. Sequential Prime Power.

Dual Utility With Standby Generator

In this arrangement, a utility-to-utility transfer switch automatically directs transfer of the load from one utility power source to another, providing nearly continuous power, as shown in **Figure 36**. In addition, the utility-to-generator set transfer switch and the generator set provide an additional level of standby power. If the utility 1 power source is interrupted, the load is transferred to the utility 2 power source. If both utility power sources are interrupted, the load is transferred to the generator set.

Dual Utility With Standby Generator (cont'd)

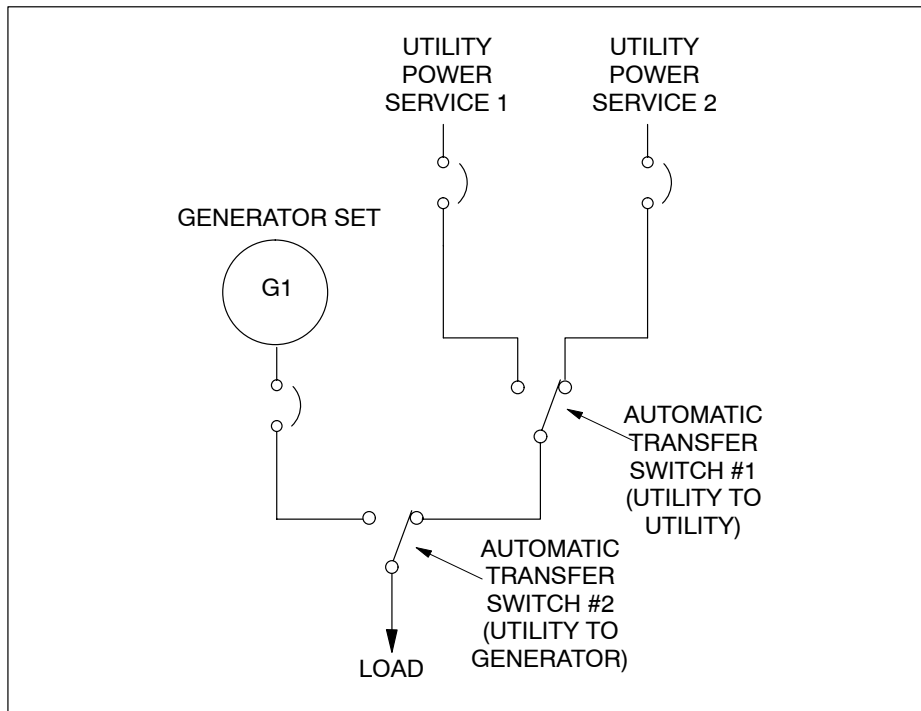


Figure 36. Automatic Dual Utility with Standby Generator Set.

Automatic Transfer Switch with Dual Remote Switches

In this arrangement, as shown in **Figure 37**, the automatic utility-to-generator set transfer switch provides the voltage sensing, generator set control signals, and the timing functions. The more economical remote/nonautomatic transfer switches respond to transfer/retransfer signals from the automatic transfer switch and provide power to their respective loads.

Automatic Transfer Switch with Dual Remote Switches (cont'd)

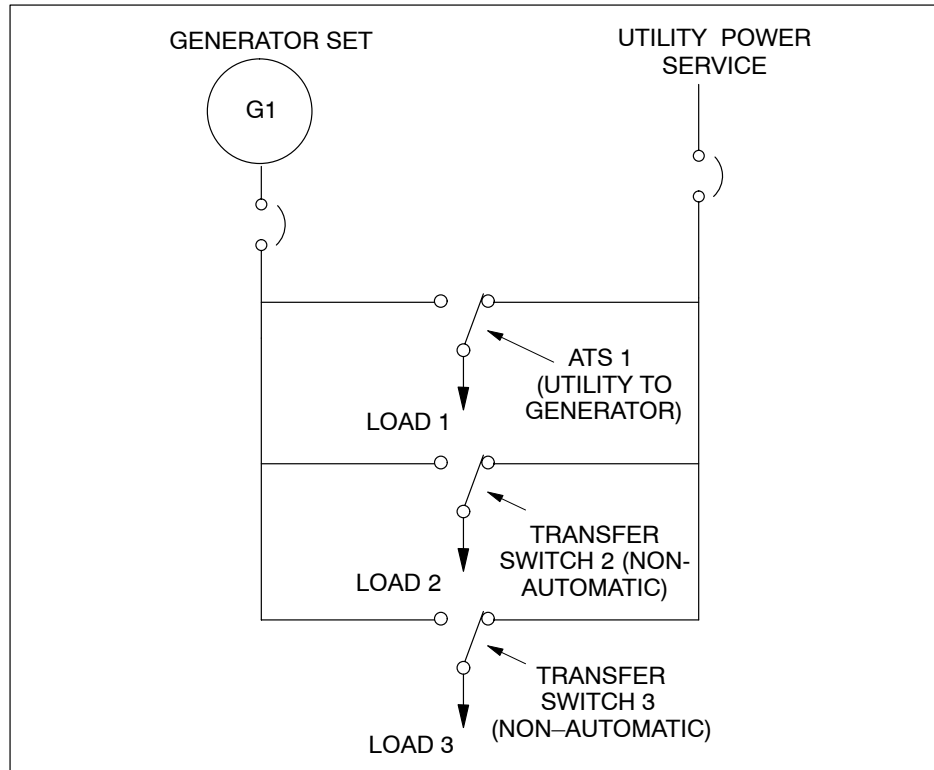


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