



A transfer switch is a device that safely transfers power between a primary source (usually the Utility Grid) and a secondary source (most often a generator system). Therefore, a transfer switch is a must-have device for safely transferring power to a load between the primary and secondary sources. So it is all about keeping operators, utility workers, and users safe. The safe transfer of power is achieved because a transfer switch is designed to ensure that the connected load can be supplied only from either the primary or the secondary power supply. Also, when utility power is taken offline, either for maintenance or due to a failure, the switch arrangement ensures that the secondary power source cannot be fed into the utility power, thereby endangering the lives of utility workers. The question is: when is it better to achieve transfer between power sources automatically rather than manual. This information sheet discusses the safety issues associated with transfer switches and when it is appropriate to select automatic transfer between power sources rather than manually activated transfer.

1.0 THE IMPORTANCE OF A TRANSFER SWITCH FOR SAFETY:

The big issue is back-feeding electrical current, which can kill utility workers. A generator system generating 240 volts without having the isolation of a transfer switch can feed power from a home or business's distribution panel up to the utility line. When this 240 volts hits a utility transformer, the transformer does what it is supposed to do and could convert this voltage on the other side to several thousand volts, which would be lethal to anyone working on the utility power line who thought it was not carrying any current. Regulations are in place to ensure that a secondary power supply is always isolated from the primary utility power to prevent potentially fatal back-feeding.

Examples of Selecting a Manual or Automatic Transfer Switch

Residential – Manual Transfer Switch (MTS)

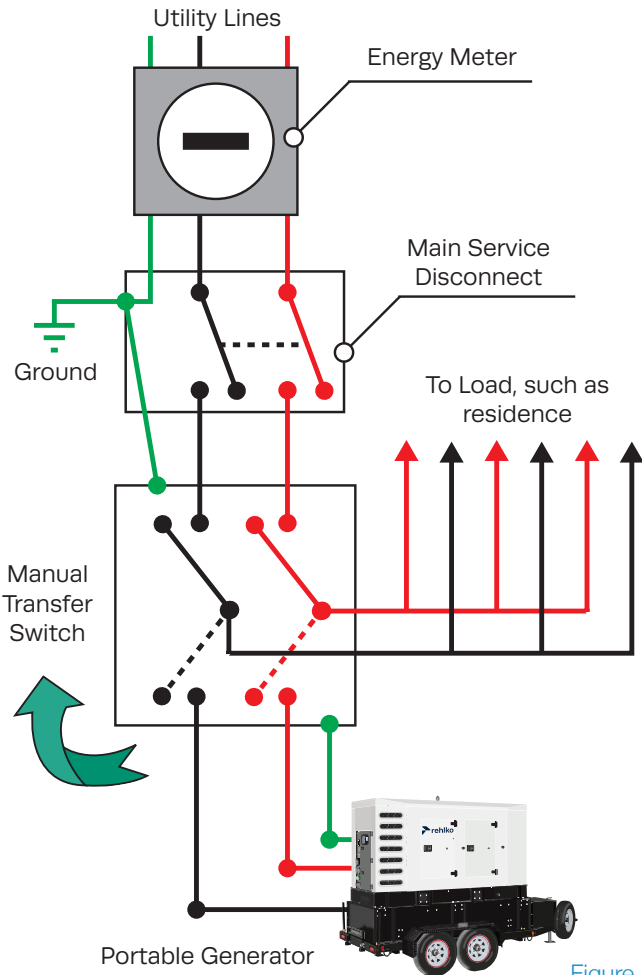


Figure -1

Healthcare – Automatic Transfer Switch (ATS)

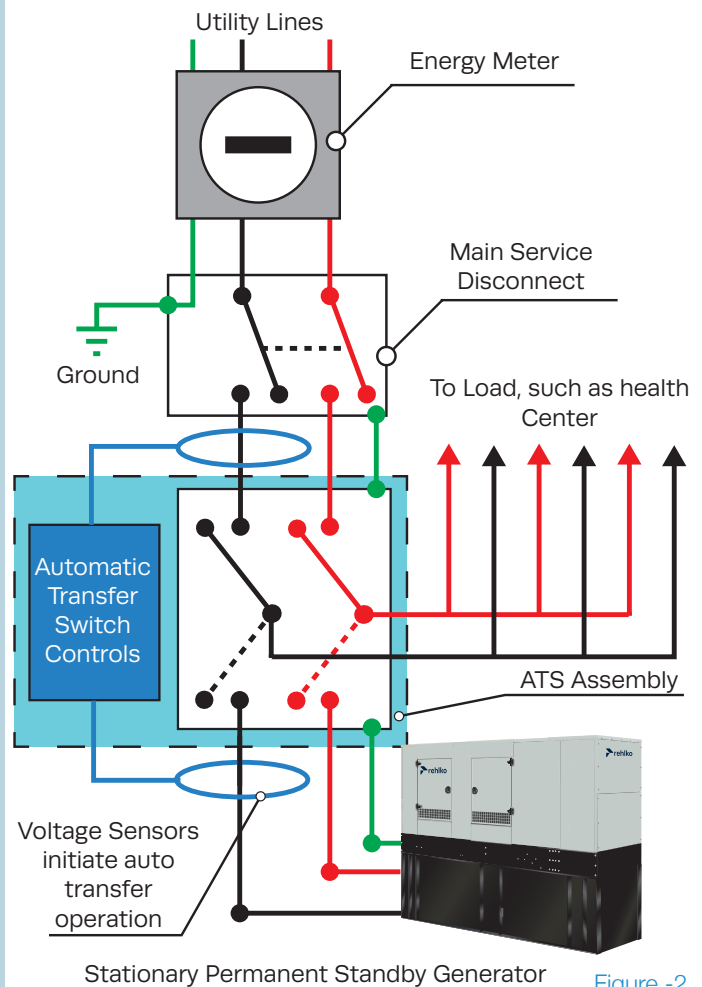


Figure -2

The installation information provided in this information sheet is informational in nature only, and should not be considered the advice of a properly licensed and qualified electrician or used in place of a detailed review of the applicable National Electric Codes and local codes. Specific questions about how this information may affect any particular situation should be addressed to a licensed and qualified electrician.



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2.0 TRANSFER SWITCHES ELIMINATE BACK-FEEDING:

Both manual and automatic transfer switches prevent this with what's called "break-before-make" switching. The connection to the utility is completely broken before the connection to your generator is made. The two power sources never meet. This happens mechanically—there's no way for both to be connected at the same time when the system is properly installed and inspected.

3.0 THE DIFFERENCE BETWEEN MANUAL AND AUTOMATIC TRANSFER SWITCHES:

The difference is self-explanatory. A Manual Switch requires manual operation to switch the connected load between the primary and secondary power sources. In contrast, an Automatic Transfer Switch (ATS) enables automatic transfer of power with no manual or operator action required. The two types operate in the following manner:

3.1 MANUAL TRANSFER SWITCHES:

A manual transfer switch is exactly what it sounds like: you physically flip switches or breakers to change your power source from the utility to your generator. There's no computer, no sensors, no automatic detection. It's mechanical and straightforward. See **Figure 1**

3.2 AUTOMATIC TRANSFER SWITCHES:

An automatic transfer switch is a different category of equipment. It's not just a mechanical switch—it's a smart system with a microprocessor that monitors your utility power 24/7 and acts when something goes wrong. See **Figure 2**

4.0 WHEN TO CHOOSE MANUAL TRANSFER OF POWER OR AUTOMATIC TRANSFER OF POWER:

A standby generator system designer has to consider several factors when determining manual or automatic, including:

- **Time Required to Transfer** - How critical is it if the power to an application is shut off? An ATS transfer takes milliseconds, whereas a manual transfer requires human intervention and can take an unknown amount of time.
- **Is Location Manned or Remote** - Is there anyone there that can manually switch power between sources?
- **Cost** - An automatic transfer switch is much more complex than a manual switch.
- **Connected Load and Tolerance for Interruption** - Electrical power in both domestic and commercial applications can supply a critical piece of equipment. Critical in both terms of life at risk and economic impact. In a domestic or healthcare facility, there could be a life-critical piece of equipment for which any delay in transferring it to a secondary power source could be life-threatening.
Data back-up employs UPS systems to ensure there is no interruption. The time required to bring a secondary system online manually may be too long to maintain uninterrupted power.
- **Emergency Power Requirement of the Load** - When primary power goes offline, not all applications require standby power for all the loads. For example, there could be a critical load that cannot tolerate any power interruption; this load would require an automatic transfer switch, while other loads could rely on a manual transfer switch or remain without power until the primary power is restored.
- **Safety and Regulation** - Various applications, such as healthcare, are subject to regulations such as NFPA 110 (see the information sheet on NFPA 110). In such cases, to make the system compliant with applicable codes, the system designer would have to specify an ATS.

5.0 WHAT IS THE FUNCTION OF AN MANUAL TRANSFER SWITCH (MTS):

An MTS is a separate switch usually located adjacent to the distribution box with the primary load input. The output side of the MTS will be connected to the defined loads, including the refrigerator, furnace, and certain outlets. When the primary power goes offline, an individual (home owner, or custodian of the facility) must manually initiate the starting of the standby generator, and after it has run up to speed, manually switch the MTS from primary power input to the generator power output; the switches are interlocked to avoid any cross-feed. The following applications typically opt for an MTS:

- **Residential Homes** - Frequently, a homeowner has invested in a 3 to 7kW portable generator that they can connect to the standby side of an MTS when the power goes out. There will be a time delay, but usually, there are no critical loads.
- **Cost Constraints** - A MTS is the least expensive option when automation is not a requirement.
- **Application is Likely to be Occupied** - Selecting an MTS assumes a person will be available to initiate manual transfer when the primary power goes offline.

6.0 WHAT IS THE FUNCTION OF AN AUTOMATIC TRANSFER SWITCH (ATS):

An ATS continually monitors the primary power to the load. When it senses that the load has gone offline or moved outside preset limits, an automatic start sequence for the generator will be initiated. When the generator has run up to speed, an automatic transfer of all, or defined critical loads, will be initiated via mechanical and electrical interlocked contacts from the primary input to the generator input. When the primary power returns, power will be returned automatically to the primary input, and the generator will be shut down. (See information sheets on ATS operation and the various types of ATS switching)

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