1. **Closed transition transfer – what is it?**

   Closed Transition Transfer is simply another way to approach switching between two power sources. A traditional Automatic Transfer Switch (ATS) uses the open transition principle also called break-before-make transfer. A Closed Transition Transfer Switch (CTTS) simply takes advantage of the latest technological advances to avoid the momentary interruption during some of the transfers. The switch logic determines if both source voltages and frequencies, and the phase relationship between the sources, are within acceptable limits. If all conditions are correct, the switch contacts are allowed to make an overlap (make-before-break) transfer. This avoids the momentary interruption or the load that occurs with traditional break-before-make transfer switches. If the source feeding the load has failed, a CTTS automatically reverts to open transition transfer operation.

2. **What are the benefits?**

   ASCO CTTS products can eliminate momentary power interruptions when transferring between two synchronized and acceptable sources. Since there is a smooth transition between sources, the stress on the downstream loads is reduced. The engine generator recovery from the step loading associated with a traditional ATS may be reduced. The reluctance associated with testing of the emergency power system is reduced since the test can be performed without disturbing the downstream loads.

   Power can be shifted without interruption from a utility to an on-site source when a storm is approaching or a brownout or voltage reduction is anticipated. Inrush currents associated with motor starting and transformer switching are eliminated during closed transition transfers. The restart time associated with metal halide and other HID lighting is eliminated during closed transition transfers.

3. **Is it needed?**

   This is a question that can only be answered based on the specific application. If a load is sensitive to the momentary off time when transferring between two acceptable sources, then a CTTS should be considered. A CTTS should also be considered: where there is a reluctance to meet code required periodic testing, for transferring transformer loads, to reduce stress on UPS systems and their batteries, for elevator switching, for utility peak-load reduction and load demand reduction applications and other similar applications.

4. **Does a CTTS meet the same codes and standards as a traditional open transition transfer switch?**

   Yes.


   The 1990 National Electrical Code, Article 23083, permits parallel operation of suitable automatic transfer switches.

   NFPA 99-1987, *Health Care Facilities*, Paragraph A-3-3.2.1.1, notes the need to
consult the utility where sources may be paralleled.
The IEEE Orange Book (ANSI/IEEE Std. 446-1987), Chapter 4; White Book
(ANSI/IEEE Std. 602-1986), Chapter 5; and Gray Book (ANSI/IEEE Std. 241-
1983), Section 5, all recommend closed transition transfer as a viable alternative to
open transition transfer.

5. **Is closed transition transfer a new concept?**
No. ASCO has been supplying these products for over 10 years. Some of the
standards mentioned above date back to 1983. Other manufacturers are now showing an interest in the CTTS concepts.

6. **Is utility company approval required?**
Yes. The utility company should always be consulted before any alternate source is connected to their lines for any length of time. An ASO CTTS contains an integrated, computerized, sensing and protective logic panel which will only permit paralleling an acceptable engine generator source with an acceptable utility source. The maximum parallel time will not exceed 100 milliseconds. Separate external protective relays are not needed since these functions are built into the ASCO CTTS.

ASCO will assist any consulting engineer in obtaining pre-approval from a utility company during meeting with utilities. Many utilities have already given approval to the use of ASCO CTTS products. Each manufacturer must obtain utility company approval for their specific product. An approval of one manufacturer’s product does not extend to the products of others.

7. **Can a CTTS be used to test the emergency power system as required by codes and standards?**
Yes.
The National Electrical Code, Article 700, Section 700-4; NFPA 99, Paragraph 3-
5.1.2.3; NFPA 110, Chapter 6; the various IEEE color books, as well as other codes
and standards, require or recommend periodic testing of the emergency power system including the ATS and the engine generator set. They do not require that the loads be interrupted for this test. This interruption has been a major reason given for the reluctance to test by facilities engineers. ASCO CTTS products have dual function test switches. One switch simulates a loss of the utility. It exercises the transfer logic, transfer operator, engine generator and its controls. A second selector switch on the ASCO CTTS allows a choice between open transition (loadbreak) and closed transition (non-loadbreak) testing. Non-loadbreak between the live utility and the engine generator overcomes the reluctance to test and eliminates potential for stress on sensitive loads. Traditional loadbreak is always available for those who want to use it. The overall power system is also subject to less stress with closed transition transfer than with open transition transfer. A CTTS can extend the life of the system components including the engine generator set, motors and their starters and shaft loads, UPS systems and their batteries, electronic equipment and the ATS contacts themselves. Overall maintenance costs could be reduced.

8. **Is a CTTS a substitute for an Uninterruptible Power Supply (UPS)?**
No. A UPS has a source of stored energy. A CTTS does not.
A UPS is meant to carry a load for short periods of time in the event of a power source failure. Some power systems feed critical loads via the UPS. An engine generator and transfer switch are often used to provide and alternate source of power for the UPS so that the load can remain reliable energized for extended periods of time.
Each time the UPS loses its source of power, the batteries are stressed, reducing their life to some degree. An ASCO CTTS minimizes the off times. The cost of an ASCO CTTS over a traditional ATS could
be offset by the potential savings in replacement UPS batteries.

9. **Does block loading a generator with a CTTS cause a momentary dip in the output voltage and frequency?**
   No more than with a traditional open transition transfer switch. In fact, the momentary voltage drop is often significantly less with a CTTS since inrush currents are avoided.
   
   An engine generator set typically needs a short period of time to recover when a load is suddenly applied. (ANSI/IEEE Std. 602 [White Book] and EGSA Std. 101P define sizing, block loading and recovery time requirements.) This block loading occurs with any open transition switch when it closes on the emergency side. If the engine generator is sized properly, the voltage drop will be within acceptable limits.
   
   When both sources are available, an ASCO CTTS momentarily shares the loads between the utility and generator. This “hand off” between the sources can reduce the effects of the sudden load application.

10. **Is additional protective relaying and active synchronization needed on a CTTS?**
    No, as long as the CTTS operates within 100 milliseconds and overcurrent protection as required by Article 240 of the National Electrical Code is provided.
    
    The type of protective relays used in cogeneration, peak-shaving or multiple engine paralleling systems typically require more than 100 milliseconds to sense an event. They would serve no purpose on a high-speed CTTS. They may be needed in closed transition switches that remain paralleled for longer periods of time.
    
    Similarly, active synchronization is not needed to hold the generator steady while the operator moves. Also, an engine generator’s governor cannot accept multiple external signals. This conflict would occur if there are multiple closed transition transfer switches each with their own active synchronizer, and a single engine generator set.

11. **Does a CTTS provide a true test of a UPS’s ability to respond to an outage?**
    A transfer switch is not meant to test equipment on its load terminal such as a UPS. A UPS and other critical loads for that matter should be subjected to their own test and preventative maintenance program as recommended by the manufacturer and required by codes and standards.
    
    NFPA 110A lists maintenance and test requirements for stored energy (UPS) systems in Chapter 6. The rotating equipment (engine generator set and transfer switch) requirements are listed separately in NFPA 110, table A-6-4.1(a).

12. **What safeguards are built into an ASCO CTTS to prevent inadvertent paralleling of both sources?**
    In the unlikelihood that both sets of contacts should remain closed for more than 100 milliseconds, the lost operator to close will automatically reopen. An alarm is indicated and the system locks itself out requiring a manual reset.
    
    If both operators should ever fail simultaneously (extremely unlikely) while their contacts are both closed, a dry contact in the logic will close. It can be used to shunt trip the source circuit breaker.
    
    The operators each draw their power from the source to which they are going. If the source is not available, this fail safe method will prevent an improper transfer.
    
    The logic panel is designed such that a failure in it will prevent incorrect operation. These features coupled with ASCO’s conservative design provide a highly reliable CTTS product.
For more information on Closed Transition Transfer Switches, refer to the following publications. To request these publications or to obtain the name and location of your ASCO local source, call 1-800-972-ASCO. Within New Jersey call 1-201-966-ASCO.

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<td>1116</td>
<td>IEEE Conference Paper – Closed Transition Switching of Essential Loads</td>
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<td>1127</td>
<td>EC&amp; M Reprint – Transfer Switching Without Load Interruption</td>
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