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GENERATION SYSTEMS

CLOSED TRANSITION SOFT LOAD  
AUTOMATIC TRANSFER SWITCHES  
FREE STANDING 800-4000 AMPERES



**Cutler-Hammer**  
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**Cutler-Hammer**



## Introduction

In typical Emergency and Standby power systems there is a momentary interruption of power when the load is transferred from one source of power to an alternate source of power. While this momentary outage is acceptable for many installations, there are installations where even the briefest outage could result in loss of valuable data or materials.

Cutler-Hammer's Closed Transition Soft Load Transfer Switch (CTVC) is designed to avoid intentional interruption of power when both sources of power are available. This is accomplished by synchronizing the two available sources, through active control of the Generator, followed by a Make-Before-Break transfer operation. The Load is then gradually transferred from one available source to the other available source. This allows regular testing of the generator under load along with retransfer to the normal source following a power outage without an interruption of power.

Typical applications include data processing, material processing, and critical care facilities where loss of power would result in lost revenue or possibly life. It is also possible to take advantage of utility sponsored load curtailment programs or avoid potential demand rate surcharges during peak power usage.

The SPB family of Closed Transition Soft Load transfer switches is available for applications covering 8

## Design Highlights

- UL 1008 Listed
- Free Standing
- Drawout SPB Insulated Case Switches
- High Withstand Rating
- Full 60 Cycle Short Time Withstand Capability
- Advanced, Integrated, Microprocessor Control
  - ATS Functions
  - Generator Control Functions
- Protective Relays (ANSI/IEEE C37.90-1989)
- Power Metering and Monitoring
- Communications Ready
- Integral Service Entrance Capability
- Durable Powder-Coated Steel Enclosures
- ISO 9001 Designed
- ISO 9002 Manufactured

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## Power Panel and Logic

### APPLICATION VERSATILITY



### INTEGRATED MICROPROCESSOR CONTROL

The Cutler-Hammer Closed Transition Soft Load Controller is a microprocessor-based, PC configurable control that incorporates traditionally discreet control components.

Available with:

- Automatic Transfer Switch Control
- Frequency and Voltage Bias Outputs for Genset Control
- Protective Relays
  - Device 25A Synchronizer
  - Device 27/59 O/U Voltage for genset and utility tie
  - Device 81 (O/U) Over/Under for genset and utility tie
  - Device 32 (O/U) Direction Power
  - Device 46N Negative Phase sequence current
  - Device 47N Negative Phase sequence voltage
  - Device 25 SyncCheck
  - Over/Under reactive power
- VAR/PF Controller
- Power Quality Monitoring
  - KW, KVAR, KVA, PF, Voltage, Current, Harmonic Distortion

### SPB SWITCH FEATURES

- UL 489 and UL1008 listed
- 65-100KA standard withstand ratings
- 60-cycle, extended withstand ratings
- Five-cycle closing speed
- Electrically operated
- True 4 pole switched neutral availability
- Totally enclosed contact assembly
- 3A/3B auxiliary contacts for customer connection (each SPB switch)

### OPTIONAL INTEGRAL OVERCURRENT PROTECTION CAPABILITY

For service entrance and other applications, Digitrip solid state trip units can be integrated into the power switching section. This eliminates the need for separate upstream protective devices, saving cost and space. Available with various combinations of Long, Short Time, Instantaneous, Ground Fault Protection and Communications.



SPB Insulated Case Switch



Optional Digitrip SPB Trip Unit



## Controls and Annunciator

### ANNUNCIATION

Normal Available (White)  
 Emergency Available (White)  
 Engine Run (White)  
 Normal Open (Green)  
 Emergency Open (Green)  
 Fail to Synch (Amber)  
 Normal Closed (Red)  
 Emergency Closed (Red)  
 Control not in Auto (White)  
 Normal Tripped (Amber)  
 Emergency Tripped (Amber)  
 Control Fault (Red)  
 Reverse Power Fault (Amber)  
 Protective Relay Fault (Red)  
 Lamp Test.

### Status Indicating Lamps provided as standard include:

Green, white or red lamps indicate normal operation, amber indicates impending failure or cautionary condition, and red indicates failure (alarm horn will sound, and generator set or utility breaker will open).

Lamps are 1 inch diameter and are clearly visible under bright room lighting conditions. Permanent labels are provided for each alarm lamp



### SYSTEM CONTROL PANEL

A system control panel provides source condition information and load transfer logic in the system. The panel contains the following components and devices:

#### FRONT PANEL METERING

Cutler-Hamner Industrial PC - All power parameters, time delays and indicators are viewable through this graphical interface.

#### FRONT PANEL CONTROLS

**Automatic Operation - Enable/Disable (Input to GPC - 2 Position Selector Switch)**

In the "Enable" position the GPC has control of the transfer switch. In "Disable", the GPC is only activated by a "Test" command.

**Test - Auto/Initiate Test (Input to GPC - Selector Switch)**

When "Automatic Operation" is disabled, this allows the "Initiate Test" to be operable.

**Transition Mode - Open/Closed (Input to GPC - 2 Position Selector Switch)**  
 Selects either open transition or closed soft load transition.

**Test Mode - Engine Run/OFF/Transfer Test (Input to GPC - 3 Position Selector Switch)** When "Automatic Operation" is "Disabled", the "Engine Run" position allows the engine to start, synchronize to utility, then shut-down without a transfer of load. Also with "Automatic Operation" disabled, "Transfer Test" initiates the engine start, synchronizes to utility, performs a soft load transfer for a predetermined time then soft load transfers back to utility (Similar to a Plant Exercise operation) In the "OFF" position, the manual mode is disabled.

**Display - On/Off (2 Position Selector Switch)** Energizes/De-energizes the Cutler-Hamner Industrial PC.

**Alarm Reset - (Input to GPC - Push Button)**  
 Resets alarm initiated by GPC.

**Alarm Silence (Input to GPC - Push Button)**  
 Disarms Horn

**Horn (Output from GPC - Piezo Alarm)**  
 Sounds when GPC senses a fault condition.



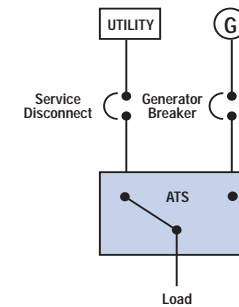
### RELAYS

Relay copy to come.

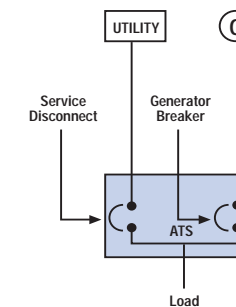
## Typical Applications

### UTILITY - GENERATOR

Transfer switches are traditionally applied between a utility and a generator set for emergency and stand-by power systems.



Standard Application



Service Entrance Application

### SERVICE ENTRANCE EQUIPMENT

Often, it is desirable to apply the transfer switch as a service equipment device thereby eliminating the need for separate service disconnects and overcurrent protective devices. This switch is particularly adaptable to wastewater and water treatment plants, pumping stations, industrial plants, telecommunications facilities and other installations where all the loads are critical in nature and need to be backed up by an alternate power source. See Publication PA.15A.03.S.E for more information.

## Basic Components Of Closed Transition Soft Load Transfer Switches



Annunciator



Optional C-H D720 PC for Metering



Integrated Microprocessor Control

Drawout SPB Insulated Case Switches or Circuit Breakers



# SPB Drawout Transfer Switch

## SPB DRAWOUT

- 800-4000A
- 2, 3, 4 pole (Except 4000A: 2 and 3 pole only)
- 120-600 Vac
- 100,000A Withstand/ Closing/Interrupting at 480 Vac
- Drawout Construction with switch position indicator
- Completely interchangeable Power Switching Devices
- PC Programmable Control
- Available in Type 1 and 3R Enclosures
- Rear, Sides, and Top Cable Access



The Cutler-Hammer Drawout SPB Switch should be considered for any system requiring either greater redundancy, easier maintainability or where true selective coordination is desired.

The Cutler-Hammer Drawout SPB Switch provides the capability to isolate either of the two power sources-Normal or Emergency- and its associated logic, while maintaining power to the load.

Each switching section is independent and can be replaced either with a spare switch or for less critical replacement needs, a replacement unit is available from the factory within 24 hours.



Programming the Controller

2000A, 3 pole Nema 3R Enclosed Drawout  
Catalog Number CTVCSPF32000XSU

## Transfer Switch Withstand Ratings

### SYSTEMS COORDINATION INFORMATION – WITHSTAND, CLOSING & INTERRUPTING RATINGS

ATS AMPERE RATING	STANDARD UL1008 3 CYCLE			60 CYCLE, EXTENDED RATING						
	Ratings when used with upstream breaker (kA)			Ratings when used with upstream fuse (kA)			Ratings used for coordination with upstream breakers with short time ratings			
	Max Fuse 240V	480V	600V	Fuse Rating	Type	600V	240V	480V	600V	
SPB Drawout										
800	100	100	85	2000	L	200	51	51	51	
1000	100	100	85	2000	L	200	51	51	51	
1200	100	100	85	2000	L	200	51	51	51	
1600	100	100	85	3000	L	200	51	51	51	
2000	100	100	85	3000	L	200	51	51	51	
2500	100	100	85	4000	L	200	51	51	51	
3000	100	100	85	4000	L	200	51	51	51	
4000	100	100	85	...	...	...	85	85	85	

# Sequence of Operations

## AUTOMATIC OPERATING MODE

### Loss of Normal Power

The system will continuously monitor the condition of the normal power supply. When phase-to-phase or phase-to-neutral voltage of the normal source is sensed outside the user adjustable set points, and after an adjustable time delay (TDES) to override momentary dips and/or outages, a contact shall close to initiate a starting of the emergency or stand-by source. Transfer to the alternate source shall take place immediately or after a user selectable time delay (TDNE) upon attainment of adjustable pick-up voltage and frequency of the alternate source.

### Return of Normal Power (Switch In Open Transfer Mode)

When the normal source has been restored and is within the pre-selected ranges for voltage and frequency and after a time-delay (TDEN) to ensure the integrity of the normal power source, the load shall be transferred back to the normal source. The generator set will continue to run for a user adjustable time (TDEC) allowing the generator set to run unloaded for cool down, after which the engine will be shut down. Upon completion the system will then be ready for automatic operation.

### Return of Normal Power (Switch in Closed Transfer Mode)

When the normal source has been restored and is within the pre-selected ranges for voltage and frequency, and after an adjustable time-delay (TDEN) to ensure the integrity of the normal power source, the load shall be transferred back to the normal source. On completion of the time delay, the generator set bus will automatically synchronize with the utility service across the utility transfer breaker. When the two systems are synchronized, the utility breaker will close and the generator set will gradually transfer all loads to the utility.

On completion of the load transfer sequence, the generator set transfer breaker will open. The generator set will continue to run for a user determined time (TDEC) allowing the generator set to run unloaded for cool down, after which the engine will be shut down. Upon completion the system will then be ready for automatic operation. Controls are provided to prevent parallel connection to the utility beyond a user adjustable period (TDUP).

## Failure of Alternate Source While Carrying The Load

Failure of the alternate source, while carrying the load, will result in the immediate transfer to the normal source upon restoration of normal power.

## TEST MODE OPERATION

There are two basic test mode operations. The "Engine Run" test mode starts and runs the engine, unloaded. The "Transfer Test" test mode initiates a transfer of the load from Normal to Emergency, in an open or closed transition mode. Tests may be programmed to operate at a user selected time each week or may be manually run.

### Transfer Test Mode (Open Transfer)

To perform an open transition transfer test, first place the Transition Mode switch in the "Open" position. Next, place the Test Mode switch in the "Transfer Test" position, followed by placing the Auto/Initiate Test switch in the "Initiate Test" position. See operation sequence for Loss of Normal Power.

Returning either the Auto/Initiate Test switch to "Auto" or the Transfer Mode switch to "Off" will cause the system to return to normal power as described in "Return of Normal Power (Switch in Open Transition Mode)".

### Test Mode (Closed Transfer)

To perform a closed transition transfer test, first place the Transition Mode switch in the "Closed" position. Next place the Test Mode switch in the "Transfer Test" position, followed by placing the Auto/Initiate Test switch in the "Initiate Test" position.

After an adjustable time delay (TDES), the generator will start and build up to rated speed and voltage. Following an adjustable time delay to allow the generator to stabilize (TDNE), the generator bus will be synchronized to the utility across the generator breaker. When the two sources are synchronized, the generator breaker closes and the generator will gradually assume all loads. When all loads have been transferred to the generator bus, the utility breaker will open.

Returning either the Auto/Initiate Test switch to "Auto" or the Transfer Mode switch to "Off" will cause the system to return to normal power as described in "Return of Normal Power (Switch in Closed Transition Mode)".

## Failure of a Generator Set to Start

If the generator set fails to start, after a user settable time delay (TDSL), the alarm will sound and the "Fail To Sync" annunciator light will light. The system will remain connected to the normal service.

## Failure of a Generator Set To Synchronize

If the generator set fails to synchronize, after a user settable time delay (TDSL), the alarm will sound and the "Fail To Sync" annunciator light will light. The controls will continue to attempt to synchronize the generator to the utility until a manual intervention occurs. The synch-check relays prevent parallel connection as long as the two sources are not synchronized.

## Failure of the Generator Set

A generator set failure will cause the generator set transfer breaker to open, and the "Fail To Sync" annunciator light and horn to operate. The load will then transfer back to the utility source, bypassing the time delay (TDEN), if it is available.

## LOAD SHED OPERATION

The Load Shed operation can be completed locally or from a remote location.

### Local Load Shed

See operation sequence for "Transfer Test" test mode.

### Remote Load Shed

Remote Load Shed operation is accomplished via a software link through the separately purchased "Virtual Power Plant Software".