

# Owner's Manual

# ASCO® Series 165 Automatic Transfer Switches rated 100, 200, & 230 amps, single phase, 240 V ac with Accessory 105E for automatic 4-wire start generators



**⚠ DANGER**  
DANGER is used in this manual to warn of risk of electrical shock from high voltages capable of causing shock, burns, or death.



**⚠ WARNING**  
WARNING is used in this manual to warn of possible personal injury.

**⚠ CAUTION**  
CAUTION is used in this manual to warn of possible equipment damage.

Installation should be performed by a licensed electrician and in accordance with the National Electrical Code (NEC) and all local electrical code requirements. Read and understand all instructions before installing, servicing, or operating. **Failure to do so could result in serious personal injuries or property damage.**



ASCO Series 165 Automatic Transfer Switches are Listed under the Underwriter's Laboratories Standard for Transfer Switch Equipment, UL-1008. They are intended for use only in optional standby systems in accordance with the National Electrical Code, NEC/NFPA 70, Article 702. This ATS is for use with 4-wire automatic start generators only.

Refer to **Application Information 381339-219** to confirm that you have selected the appropriate product for the intended installation.

## Rating Label

Each Automatic Transfer Switch (ATS) has rating labels to define the loads and fault current withstand/ closing ratings. Refer to those label on the Transfer Switch for specific values.



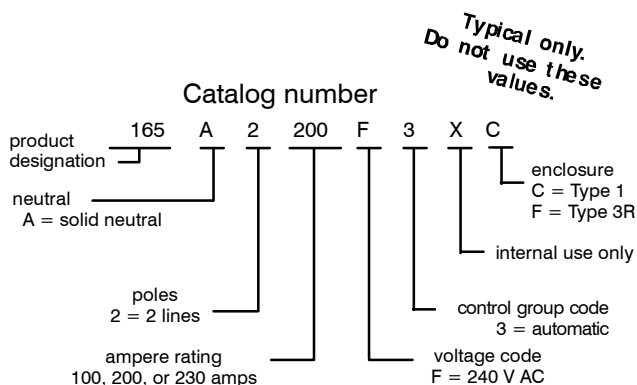
**⚠ WARNING**  
**INJURY or SWITCH DAMAGE**  
Do not exceed the rating label values; it can cause personal injury or serious switch damage.

## Nameplate

The Transfer Switch nameplate includes data for each specific ASCO Series 165 ATS. Use the switch only within the limits shown on this nameplate. A typical Catalog Number is also shown below with its elements explained:

**ASCO®**      **Series 165**

**Automatic Transfer Switch for use on Standby Systems**  
**Cat No 165A2200F3XC**  
**Ser No 123456**  
**200 A BOM 999999**  
**240 V 60 Hz**



**ASCO** Power Technologies®      50 Hanover Road, Florham Park, New Jersey 07932-1591 USA  
1 800 937-2726 (ASCO), for service call 1 800 800-2726 (ASCO)      www.asco.com

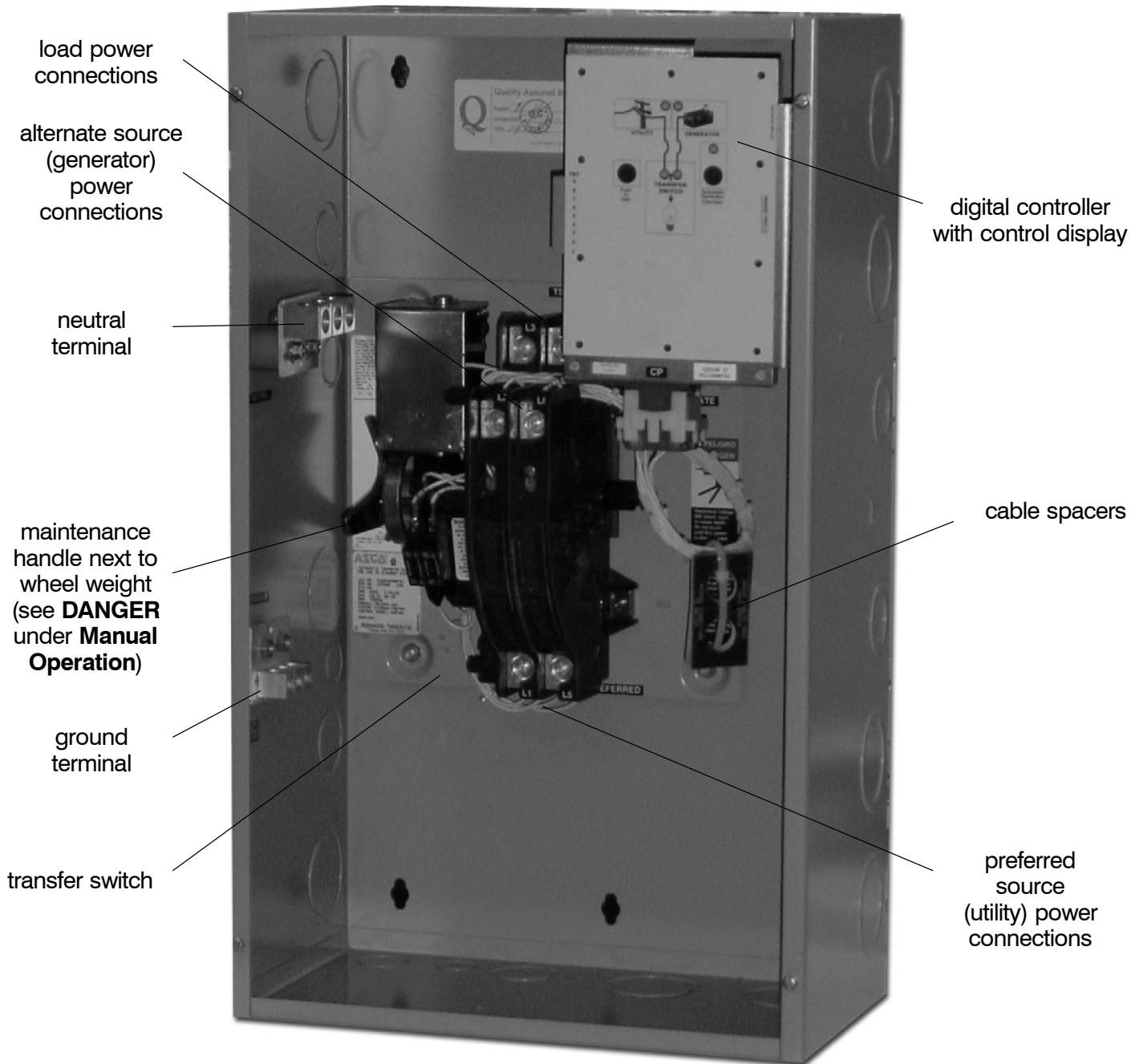
ASCO POWER TECHNOLOGIES CANADA PO Box 1238, 17 Airport Road, Brantford, Ontario, Canada N3T 5T3  
telephone 519 758-8450, fax 519 758-0876, for service call 1 888 234-2726 (ASCO)      www.asco.ca

**381333-236 A**



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Series 165 Automatic Transfer Switch in Type 1 enclosure (cover removed)

## SPECIFICATIONS

### ENCLOSED AUTOMATIC TRANSFER SWITCH

Enclosure Size  
Type 1 ..... 24" H x 14<sup>1</sup>/<sub>4</sub>" W x 8" D  
(610 mm H x 362 mm W x 203 mm D)  
Type 3R ..... 25" H x 14<sup>3</sup>/<sub>4</sub>" W x 8<sup>1</sup>/<sub>2</sub>" D  
(635 mm H x 375 mm W x 216 mm D)  
Weight Type 1 enclosure ..... 67 lb  
Type 3R enclosure ..... 82 lb  
Temperature  
Operating ... -4° F to +122° F (-20° C to +50° C)  
Storage .... -67° F to +149° F (-55° C to +65° C)

### TRANSFER SWITCH

Poles ..... 2  
Voltage (nominal) ..... 220–240 V ac single phase  
Frequency (nominal) ..... 60 Hz  
Current (depending upon the unit) 100, 200, or 230 amps  
Withstand / Close-On Current ..... 10,000 amps  
RMS Symmetrical amps 240 V ac max.  
for any circuit breaker, manufacturer, or Type  
per National Electrical Code, NEC/NFPA 70  
100 amp. Transfer Switch power terminals accept wire sizes  
one #14 to 4/0 AWG AL or CU  
200 amp. Transfer Switch power terminals accept wire sizes  
one #14 to 4/0 AWG CU (copper only)  
230 amp. Transfer Switch power terminals accept wire sizes  
one #14 to 4/0 AWG CU (copper only)

### CONTROLLER


Voltage (nominal) ..... 220–240 V ac  
Pickup (source acceptable) ..... 204 V ac  
Dropout (source unacceptable) ..... 180 V ac  
Frequency (nominal) alternate (generator) source . 60 Hz  
Pickup (source acceptable) ..... 57 Hz  
Dropout (source unacceptable) ..... 54 Hz  
Overfrequency ..... 69 Hz  
Generator control contacts (two provided)  
1 Start (crank) spdt 5 A max / 300 mA min at 30 V dc max.  
three starting cycles (10 sec. crank, 10 sec. rest)  
2 Run ... spdt 5 A max / 300 mA min at 30 V dc max.  
terminals accept #22 to #14 AWG  
stranded copper wire per terminal  
Time Delays  
Ignore preferred (utility) source outages ..... 3 sec.  
Ignore alternate (generator) source outages .... 15 sec.  
Load transfer to alternate (generator) source ... 15 sec.  
Load retransfer to preferred (utility) source ..... 5 min.  
Generator cooldown period (after load retransfer) 1 min.  
Automatic Generator Exerciser  
Repeat time ..... every 14 days  
Duration ..... 20 minutes

## INTRODUCTION

### INTRODUCTION

ASCO Series 165 Automatic Transfer Switches are Listed under the Underwriter's Laboratories Standard for Transfer Switch Equipment, UL-1008. They are intended for use only in optional standby systems in accordance with the National Electrical Code, NEC/NFPA 70, Article 702.

This automatic transfer switch is intended for standby power applications in residential or light commercial use only.

	<b>WARNING</b> <b>The Series 165 Automatic Transfer Switch is not for emergency or life-support systems.</b>
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### **This product is not intended for emergency or life-support systems.**

If you have more stringent application requirements contact ASCO for other products suitable for critical applications.

The automatic transfer switch helps provide safe connection of the alternate source (generator) to the electrical load after disconnecting the preferred source (utility). It contains a double-throw, electromechanical switching device for inherent isolation of the preferred and alternate sources. This isolation prevents the danger of connecting the utility to the generator which could cause damage or personal injury. The automatic transfer switch's digital controller provides continuous monitoring of both power sources and a start/stop signal to the generator.

# INSTALLATION

Installation of the ASCO Series 165 automatic transfer switch must be performed by a licensed electrician. It must be installed according to the National Electrical Code and all local electrical code requirements. Refer to the installation drawing and wiring diagram.

## ⚠ CAUTION

**MALFUNCTION or SHORTENED LIFE**  
Protect the unit from construction grit and metal chips to prevent malfunction or shortened life.

Remove the enclosure cover and inspect the unit for shipping damage. If damage is evident do not install the unit. Type 1 enclosure is for indoor use only (refer to local codes for Type 4 use). Mount the automatic transfer switch vertically to a rigid supporting structure. Level all mounting points with flat washers behind the holes to avoid distortion of enclosure.

## ELECTRICAL LINE CONNECTIONS

Installation wiring must be performed by a licensed electrician in accordance with the National Electrical Code (NEC) and all local electrical code requirements.

The automatic transfer switch must be protected by suitably sized circuit breakers feeding the preferred and alternate source terminals. The ratings of the circuit breakers must be based on the requirements of the National Electrical Code for its nameplate ampere and short circuit withstand ratings. See the wiring diagram provided with the unit.

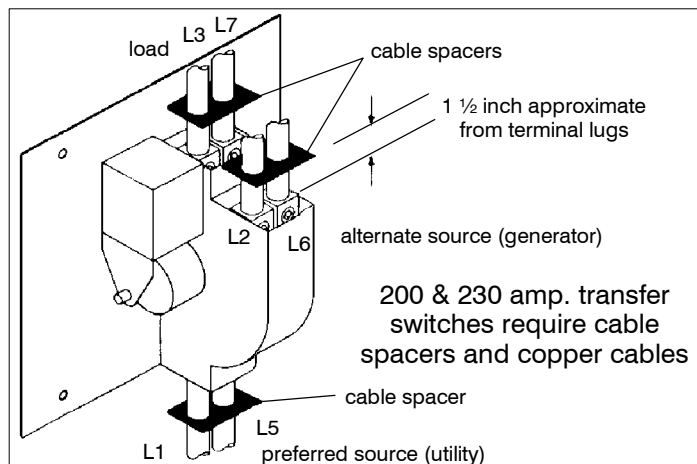


## ⚠ DANGER

**ELECTROCUTION HAZARD**  
Turn off utility power and turn off the generator to prevent electrocution when wiring the transfer switch.

## CABLE SPACERS (200 and 230 amp. units)

Three cable spacers are included with 200 and 230 ampere size transfer switches. Run the power cables through the cable spacers as shown here and position the cable spacers approximately 1½ inches from the terminal lugs. Use copper cables for 200 and 230 amp. transfer switches.



## ⚠ CAUTION

**CABLE LOOSENING DUE TO SHORT-CIRCUIT. Install 3 cable spacers 1½ in. from terminal lugs to prevent cables from loosening in a short-circuit condition.**

## CABLE CONNECTIONS (see wiring diagram)

Prepare the wires for connection as follows: strip the insulation; avoid nicking or ringing the conductors when stripping the cable. Remove surface oxides from conductors by cleaning with a wire brush. Apply electrical joint compound and wipe away excess. Insert prepared cable into lug and tighten the lug to the torque specified on the rating label on the transfer switch.

Connect the preferred source (utility) line 1 and 2 wires to the terminal lugs marked **L1** and **L5** at the bottom. Connect the alternate source (generator) line 1 and 2 wires to the terminal lugs marked **L2** and **L6** at the upper middle. Connect the load line 1 and 2 wires to the terminal lugs marked **L3** and **L7** at the top of the transfer switch. Neutral and ground terminals are provided.

## GENERATOR STARTING CONTACTS

Before wiring the generator starting contacts refer to the generator manufacturer's installation manual for requirements. Make all connections to the controller with the generator battery disconnected. Verify that the ignition switch is in the OFF position. Connect the generator starting contacts to the appropriate terminals on terminal block TB7 on the Controller (CP). See the wiring diagram provided with the unit.

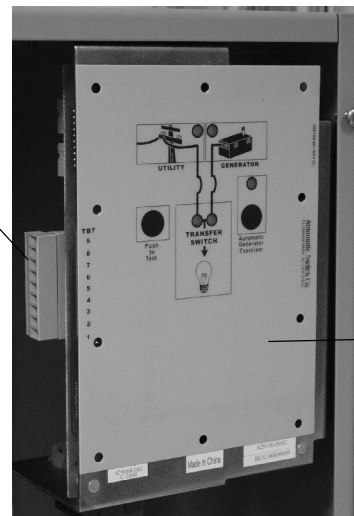
For wiring convenience terminal block TB7 has a removable plug. Reconnect the plug with terminal screws facing inward.

## ⚠ CAUTION

**CONTROLLER DAMAGE. Observe polarity when connecting the generator battery to the controller. Refer to wiring diagram. Be sure to reinstall the TB7 block with terminal screws facing inward.**

removable terminal block TB7

**Be sure to reinstall with terminal screws facing inward.**



digital controller

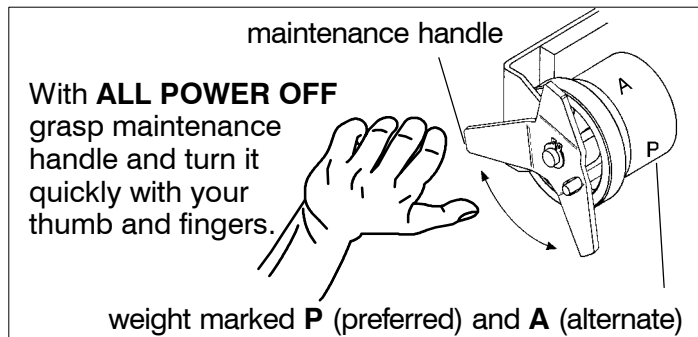
## FUNCTIONAL TEST (after installation)

After installing the Series 165 automatic transfer switch perform the following three-part functional test.

### 1 – MANUAL OPERATION

	<p style="text-align: center;"><b>⚠ DANGER</b></p> <p><b>ELECTROCUTION – FLASH HAZARD</b> Do not manually operate the transfer switch until utility and generator are disconnected; open circuit breakers.</p>
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1. Put both the preferred source circuit breaker and the alternate source circuit breaker feeding the automatic transfer switch in the **OFF** position. Verify that **ALL POWER IS OFF** ! (See page 2 for handle location.)
2. Grasp the maintenance handle and turn it quickly with your thumb and fingers to manually operate the transfer switch. The switch should operate smoothly without binding. If it does not, check for shipping damage or construction debris.




3. After checking the manual operation operate the handle again quickly to return the transfer switch to the preferred position (letter **P** on the round weight facing you).

### 2 – VOLTAGE CHECKS

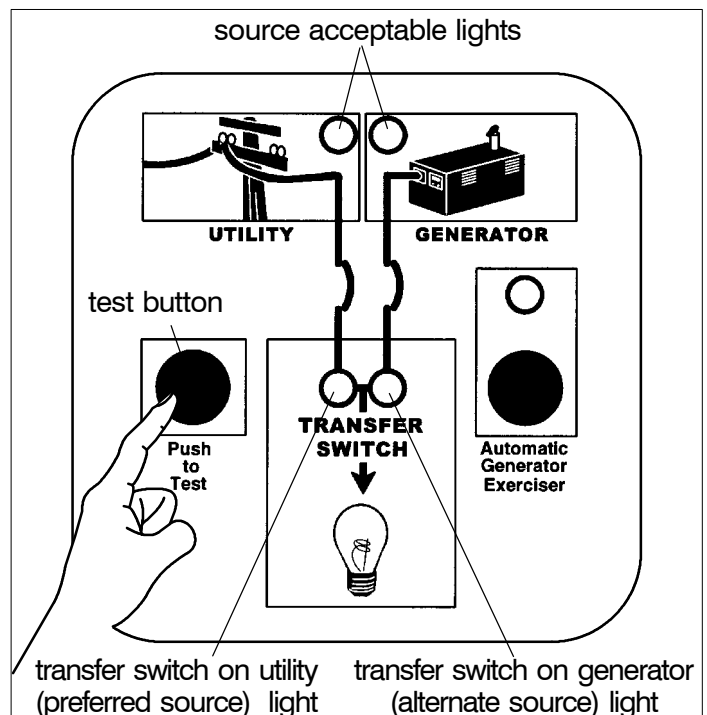
The Series 165 automatic transfer switch is rated for nominal 240 V ac at 60 Hz (as stated on the nameplate). Verify that both your preferred and alternate sources are also 240 V ac nominal, 60 Hz. See the wiring diagram.

### 3 – ELECTRICAL OPERATION

This procedure checks the electrical operation of the automatic transfer switch. If the actual operation does not follow this procedure, consult the *Troubleshooting* section.

	<p style="text-align: center;"><b>⚠ WARNING</b></p> <p><b>PERSONAL INJURY HAZARD</b> Install front cover before operation. An electrical system fault could cause a flash and cause injury.</p>
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1. Install the enclosure cover and tighten the screws.
2. Verify that the generator battery is connected and that the generator's starting controls are set for automatic.



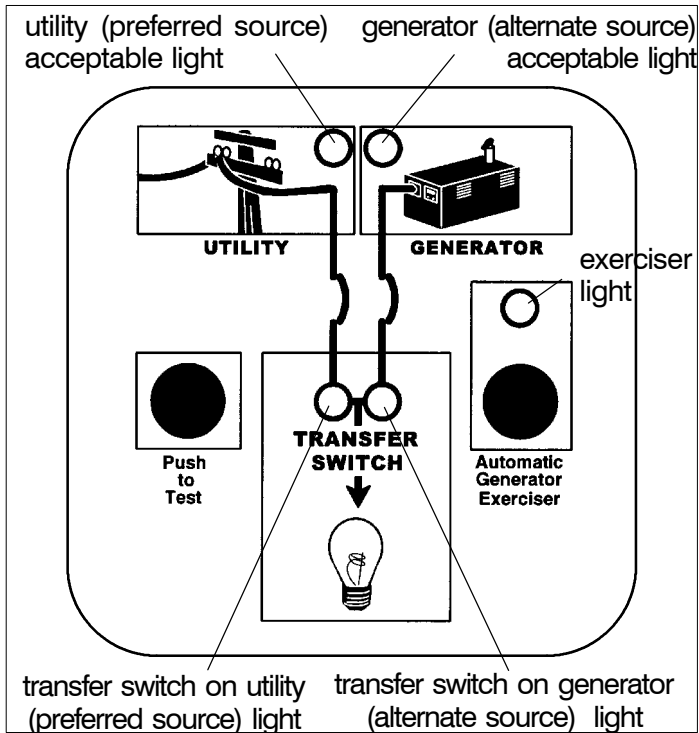
3. Turn on the preferred source (utility) circuit breaker.
4. Turn on the alternate source (generator) circuit breaker.
5. Verify that **UTILITY** (preferred source) acceptable light is on.
6. Verify that the **TRANSFER SWITCH** on utility (preferred source) light is on.
7. This step will start the generator. Press and hold the **Push to Test** button until the **GENERATOR** (alternate source) acceptable light comes on and stays on. Then release the button.

This light indicates that the generator is running and that its output voltage and frequency are acceptable. Under typical conditions, the light should come on after about 5 to 10 seconds. If the generator is running and fails to produce the proper voltage and frequency after 60 seconds then a malfunction has occurred (consult the *Troubleshooting* section).

8. About 15 seconds after the **GENERATOR** (alternate source) acceptable light comes on, the automatic transfer switch transfers the load from the utility to the generator. The **TRANSFER SWITCH** on generator (alternate source) light comes on.
9. The transfer switch stays connected to the generator for 5 minutes. Then the load is transferred back to the utility. To bypass time delay, press and release the **Push to Test** button again.
10. After load retransfer to utility, the generator runs 1 minute (without load), then shuts down. The **GENERATOR** acceptable light goes off indicating that generator is off.

This completes the *Functional Test*. Proceed to next page.

## OPERATION



### INDICATOR LIGHTS

On the front control display are five lights that indicate the status of the sources and the automatic transfer switch.

- **Utility (preferred source) acceptable**  
(light at the top left of the display)
  - When on, this light indicates that the utility voltage is acceptable for connection to the load.
- **Generator (alternate source) acceptable**  
(light at the top right of the display)
  - When on, this light indicates that the generator voltage and frequency are acceptable for connection to the load.
- **Transfer Switch on utility (preferred source)**  
(light at the center left of display)
  - When on, this light indicates that the load is connected to the utility (preferred source).
- **Transfer Switch on generator (alt. source)**  
(light at the center right of display)
  - When on, this light indicates that the load is connected to the generator (alternate source).
- **Automatic Generator Exerciser**  
(light above button at the right of display)
  - When the utility is acceptable and the load is on the utility, this light flashes the number of days until the next exercise period. When it is off, no exerciser period is set. The light is also off any time the generator is running.

### PUSH BUTTONS

On the front control display are two push buttons that control the operation of the generator and the automatic transfer switch.

- **Push to Test** (button on the left side)
  - This button is used to test the system. See the **Manual Generator Testing** section on the next page.
  - This button can be used to cancel any active time delay. Press and release the button to bypass the time delay.
  - This button can be used to clear displayed error codes. See **Troubleshooting** section, *Problem 8*.
- **Automatic Generator Exerciser** (right button)
  - This button is used to set the automatic generator exerciser. See the next page.

### UTILITY FAILURE

The load is normally connected to the preferred source (utility) if that source is acceptable. If the preferred source (utility) fails, the following sequence occurs:

1. The **UTILITY** source acceptable light goes off.
2. The automatic transfer switch waits three seconds to prevent nuisance starting of the generator from momentary dips of the utility voltage. If the utility is restored during the three seconds, the **UTILITY** source acceptable light comes on and no further action is taken.
3. If the utility remains unacceptable for three seconds, the automatic transfer switch cranks and starts the generator.
4. Once the generator starts, the automatic transfer switch waits until the generator voltage and frequency are acceptable. Then the **GENERATOR** source acceptable light comes on.
5. When the generator is acceptable, the automatic transfer switch waits 15 seconds to allow the generator to warm up. Then it transfers the load to the generator. The **TRANSFER SWITCH** on generator (alternate source) light comes on.
6. The automatic transfer switch waits for the utility source to be restored. When the utility again becomes acceptable the **UTILITY** source acceptable light comes on.
7. The automatic transfer switch then waits 5 minutes to allow the utility to stabilize. Then it retransfers the load back to the utility. The **TRANSFER SWITCH** on utility (preferred source) light comes on.
8. After load retransfer the generator will continue to run unloaded for one minute for engine cooldown. Then it is stopped. The **GENERATOR** acceptable light goes off.

## AUTOMATIC GENERATOR EXERCISER

The automatic generator exerciser automatically exercises the generator for 20 minutes once every 14 days.

### TO SET EXERCISER

Press and release the **Automatic Generator Exerciser** button. After about 8 seconds the exerciser light flashes 14 times to indicate that the exerciser has been set. The number of flashes indicates the number of days until the next exercise period (at approximately the same time the button was pressed).

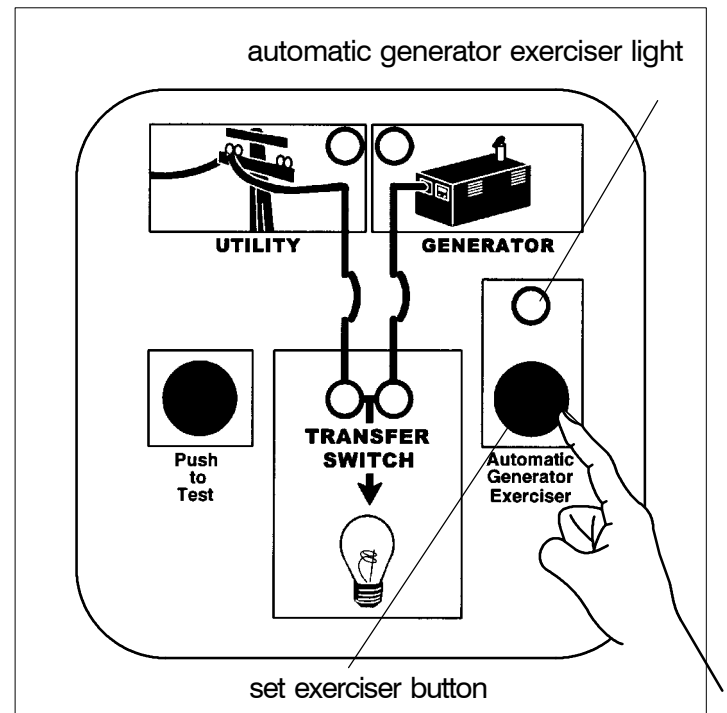
### TO DISABLE EXERCISER

Press and hold the **Automatic Generator Exerciser** button until the light above the button goes off (light flashes then goes off). The exerciser is now disabled and the light is off.

### TO ENABLE EXERCISER

Press and hold the **Automatic Generator Exerciser** button until the light goes off (light flashes then goes off). Exerciser is now enabled. After about 8 seconds exerciser light flashes 14 times to indicate that the exerciser has been re-enabled.

**Note:** With a total power failure (utility failure and generator fails to start) the exerciser must be reset after power is restored.



## MANUAL GENERATOR TESTING

### GENERATOR TEST WITH LOAD TRANSFER

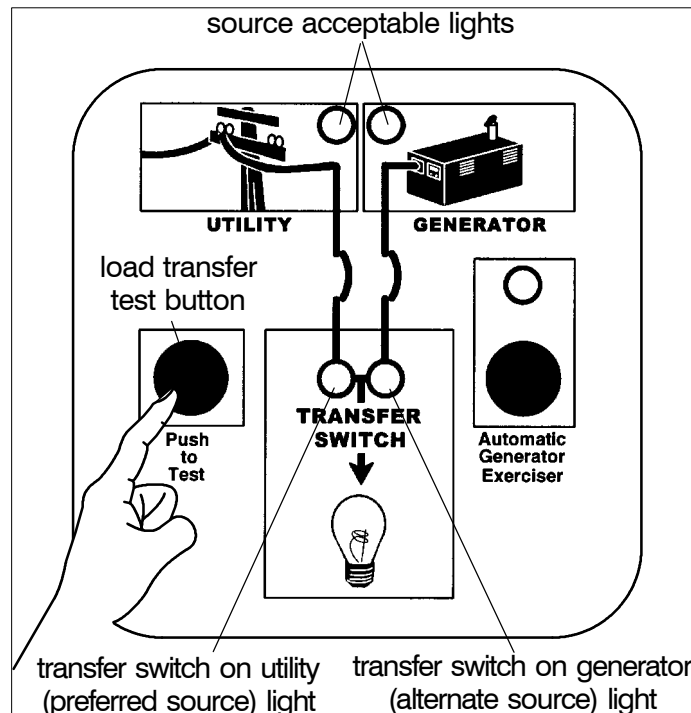
During this test a utility failure is simulated. The generator starts and the load transfers to the generator. Then the load retransfers back to the utility and generator stops.

1. Press and hold the **Push to Test** button until the **GENERATOR** acceptable light comes on and stays on (the generator cranks and starts).
2. The automatic transfer switch waits 15 seconds to allow the generator to warm up. Then it transfers the load to the generator. The **TRANSFER SWITCH** on generator (alternate source) light comes on.
3. After 5 minutes the automatic transfer switch retransfers the load back to the utility. To bypass the time delay, press and release the **Push to Test** button again. The **TRANSFER SWITCH** on utility (preferred source) light comes on.
4. After load retransfer the generator will continue to run unloaded for one minute for engine cooldown. Then it is stopped. The **GENERATOR** acceptable light goes off.

### GENERATOR TEST WITHOUT LOAD TRANSFER

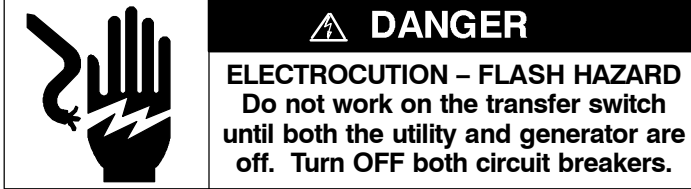
During the test the generator cranks and starts and the **GENERATOR** light comes on (if it is acceptable). After running for 20 minutes it stops. Throughout the test the load remains connected to the utility (the automatic transfer switch does not transfer the load to the generator).

1. Press and release (do not hold) the **Push to Test** button. The generator cranks and starts, and the **GENERATOR** acceptable light comes on and stays on.
2. The generator runs for 20 minutes. The automatic transfer switch does not transfer the load to the generator. The **TRANSFER SWITCH** on utility (preferred source) light stays on.
3. To bypass the time delay or cancel the test, press and release the **Push to Test** button again.
4. The generator stops and the **GENERATOR** acceptable light goes off.



# TROUBLESHOOTING

This troubleshooting guide describes some of the simple causes of problems with the installation of the automatic transfer switch. **Troubleshooting beyond the scope of this guide should not be attempted by the installer.** A licensed electrician must perform all internal troubleshooting. ASCO can be contacted at 800-937-ASCO or www.asco.com.



## Problem 1

The **UTILITY** acceptable light does not come on when utility power is connected to the automatic transfer switch.

- Verify that the utility feed is 240 V ac nominal and 60 Hz.
- Verify that the utility feed is wired to the terminal lugs on the bottom of the transfer switch marked **L1** and **L5**.
- Verify that the utility feed is connected and that its circuit breaker is ON.
- With **ALL POWER OFF**, verify that the transfer switch harness is connected properly to the controller (plug at the bottom).

## Problem 2

Power is connected (**UTILITY** acceptable light and/or **GENERATOR** acceptable lights are on) but both **TRANSFER SWITCH** position lights are off.

- With **ALL POWER OFF**, verify that the transfer switch harness is connected properly to the controller (plug at the bottom).

## Problem 3

Generator does not crank when the utility source fails or when the **Push to Test** button is pressed.

- Verify that the generator starting controls are set for automatic operation.
- Verify engine start low voltage wiring between controller terminal block TB7 (plug on the left) and the generator. Check that TB7 plug is properly seated in TB7 receptacle.
- Verify that the generator battery is connected and that the battery voltage meets the generator manufacturer's recommendation.
- Verify that the correct contact (normally open or normally closed) is being utilized (see the generator manual).

## Problem 4

Generator cranks but does not start when the utility source fails or when the **Push to Test** button is pressed.

- Verify engine start low voltage wiring between controller terminal block TB7 (plug on the left) and the generator. Check that TB7 plug is properly seated in TB7 receptacle.
- Verify proper generator operation (see generator manual).

## Problem 5

The automatic transfer switch does not transfer the load to the generator (**TRANSFER SWITCH** on generator light does not come on).

- Verify that the **GENERATOR** source acceptable light is on. The transfer switch will not retransfer the load to the generator until the generator output is acceptable. If the light is off verify that the circuit breaker for the generator feed is ON.
- Wait 15 seconds. There is a 15 second delay after the generator output becomes acceptable to permit the generator to warm up.
- If the **GENERATOR** source acceptable light still does not come on, see *Problems 3* and *4*.

## Problem 6

The automatic transfer switch does not transfer the load back to the utility (**TRANSFER SWITCH** on utility light does not come on).

- Verify that the **UTILITY** source acceptable light is on. The transfer switch will not retransfer the load to the utility until the utility source is acceptable and the light is on. If light is off, verify that the circuit breaker from the utility feed is ON.
- Wait 5 minutes. There is a 5 minute delay on retransfer to the utility.

## Problem 7

The **GENERATOR** source acceptable light does not go off after the automatic transfer switch retransfers the load back to the utility.

- Wait 1 minute. After load retransfer to the utility, there is a 1 minute delay for generator cooldown before shut down.
- Verify proper operation of the generator (see the generator manual).

## Problem 8

Both **TRANSFER SWITCH** position lights are flashing (this indicates an error condition). \*

- Count the number of times the **Automatic Generator Exerciser** light flashes (repeats after pause). This number is the error code.
- Error codes:
  - 2 Generator failed to start. See Problems 3 and 4.
  - 3 Generator failed after starting. See generator manual.
  - 4 Generator over frequency. See generator manual.
  - 5 Transfer Switch did not transfer the load to the generator. Service required.
  - 6 Transfer Switch did not transfer the load to the utility. Service required.
  - 7 Controller error. Service required.
- To clear error code, press and release **Push to Test** button.

\* NOTE: These lights will flash only when controller power is available from either of the two power sources.